Paraxial Architecture + Hypodigital Space :
Exploring the relationship between
the Physical and the Digital in Architecture

by

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Fig. 1. Frontispiece

Abstract

The term 'Paraxial' Architecture simply means, an architecture which exists concurrently to, but is separate from, traditional architecture. It refers very specifically to an emerging type of architecture which is very close to but is definitely separate from both the practice of architecture and theoretical architecture. It refers to the architecture of the entertainment industry, and the entertainment designers who design buildings for use in these fields.

This study also explores the idea of the 'hypodigital', or digital space of inhabitation, and the 'pseudodigital', or digital space of representation. It focuses mainly on the hypodigital, and what such spaces entail. Thus by using techniques on space creation learned from entertainment designers, coupled with game technology to create hypodigital spaces, a dual-building expansion is proposed to explore the relationship between the *physical and the digital in architecture*. This begins to create a dialogue between traditional and Paraxial architecture, its practices and its execution, each influencing the other.

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Table of Contents

Frontispiece	ii
Abstract	iii
Acknowledgements	iv
Table of Contents	v
List of Illustrations	vi
PART I THE THEORY	
Chapter 1. Introduction	2
Chapter 2. The Paraxial	6
Chapter 3. Entertainment Design	9
ii. A Brief History	9
iii. Major Entertainment Designers	17
Chapter 4. Digital Space	36
i. Examples and Applications	39
PART II THE PROJECT	
Chapter 5. The Existing Building	55
i. Introduction	55
ii. A History of the Building	58
iii. The New Tenants: The French Seventh Day Adventist Church	68
iv. The Documentation Process	72
Chapter 6. The Proposal	83
i. The Dual-Building Expansion	83
ii. The Site	83
iii. The Traditional Expansion	86
iv. The Paraxial Expansion	111
Chapter 7. Conclusion	122
PART III THE APPENDICES	
Appendix A. Game Technology	125
i. A Brief History	126
ii. Current Engines	131
Appendix B. Adventist Beliefs	150
Bibliography	164

List of Illustrations

FIGURE	TITLE AND REFERENCE	PAGE
Fig 1	Frontispiece <i>[By Author]</i>	II
Fig 2-4	Early conceptual paintings by McQuarrie for 'Star Wars' <i>[The Art of Star Wars - A New Hope Pg 57 71, 93]</i>	11
Fig 5-7	Production paintings for 'Blade Runner' showing Mead's designs for downtown Los Angeles <i>[http://www.ninjavspenguin.com/blog/2007/10/20/blade-runner-concept-art/]</i>	14
Fig 8	Blade Runner' Character J F Sebastian's Home and Workstation in the Bradley Building <i>[http://www.ninjavspenguin.com/blog/2007/10/20/blade-runner-concept-art/]</i>	20
Fig 9	Petrified Tree' - 'Guild Wars' concept for Ardorstone <i>[http://bldgblog.blogspot.com/2008/04/gamespace-interview-with-daniel-dociu.html]</i>	21
Fig 10	Floating Mosque' - Personal Study <i>[http://bldgblog.blogspot.com/2008/04/gamespace-interview-with-daniel-dociu.html]</i>	21
Fig 12	Guild Wars' area concept <i>[http://bldgblog.blogspot.com/2008/04/gamespace-interview-with-daniel-dociu.html]</i>	21
Fig 13	Guild Wars' area concept <i>[http://bldgblog.blogspot.com/2008/04/gamespace-interview-with-daniel-dociu.html]</i>	21
Fig 14	Building Concept - FZD in class demonstration <i>[http://www.fengzhudesign.com/gallery_page_22.htm]</i>	24
Fig 15	Architecture/Supership Variations FZD in class demonstration <i>[http://www.fengzhudesign.com/gallery_page_03.htm]</i>	24
Fig 16	Enemy/Alien Architecture - FZD in class demonstration <i>[http://www.fengzhudesign.com/gallery_page_05.htm]</i>	24
Fig 17	Architecture and Lighting FZD in class demo <i>[http://www.fengzhudesign.com/gallery_page_11.htm]</i>	24
Fig 18-23	Environment/Architecture Variations - FZD in class demonstrations <i>[http://www.fengzhudesign.com/gallery_page_04.htm]</i>	25
Fig 24	The Artifact' - Dead Space <i>[http://www.ryanchurch.com/dead-space/]</i>	28
Fig 25	The Clinic' - 'The Ishimura' Interior - Dead Space <i>[http://www.ryanchurch.com/dead-space/]</i>	28
Fig 26	Dead Space area concept <i>[http://www.ryanchurch.com/dead-space/]</i>	28

FIGURE	TITLE AND REFERENCE	PAGE
Fig 27-29	Mygeeto Architecture - Star Wars Episode III [The Art of Star Wars - Episode III Pgs 13 41][http://www.ryanchurch.com/]	29
Fig 30	Sinkhole Architecture - Episode III [The Art of Star Wars - Episode III Pg 11]	29
Fig 31	Bridgeworld Architecture - Star Wars Episode III [http://www.ryanchurch.com/]	29
Fig 32	Starfleet Academy Lecture Hall - Star Trek [http://conceptartworld.com/?p=2121]	29
Fig 33	The Citadel' - Half Life 2 Concept Painting [http://www.vulkanbros.com/intro.html]	33
Fig 34	The Citadel Interior' - Half Life 2 Study [http://www.vulkanbros.com/intro.html]	34
Fig 35	The Crossing - Overworld Study [http://www.vulkanbros.com/intro.html]	34
Fig 36	The Crossing - Overworld Study [http://www.vulkanbros.com/intro.html]	35
Fig 37	The Crossing - Overworld Study [http://www.vulkanbros.com/intro.html]	35
Fig 38-39	Screenshots of Cowboys Stadium in ARCHengine [http://www.unrealengine.com/showcase/visualization/cowboys_stadium/]	41
Fig 40	Adobe Museum of Digital Media - Exterior [http://www.adobemuseum.com/]	44
Fig 41	Adobe Museum of Digital Media - Interior [http://www.adobemuseum.com/]	44
Fig 42	Uncanny Valley' Exhibition - Adobe Museum of Digital Media The exhibition takes place in a site-less black void [http://www.adobemuseum.com/]	44
Fig 43	Colossi Concept sketch - 'Shadow of the Colossus' [http://gamersblock.net/gamefluid/?p=602]	46
Fig 44	Colossi in Game - 'Shadow of the Colossus' [http://xaikira.wordpress.com/2010/02/16/26/]	46
Fig 45	Portal - In game screenshot [http://joegriffinwrites.blogspot.com/2011/06/portal-2-review.html]	49
Fig 46	Portal - Frontispiece [http://kotaku.com/351448/portal+meets+escher-will-drop-your-jaw]	49

FIGURE	TITLE AND REFERENCE	PAGE
Fig 47	L A Noire - Screenshot <i>[http://www.g4tv.com/games/xbox-360/51451/la-noire/articles/72842/la-noire-preview-investigating-the-detective-thriller/]</i>	52
Fig 48	Grand Theft Auto IV- Screenshot <i>[http://earthli.com/news/view_article.php?id=1825]</i>	52
Fig 49-51	Real life landmarks (Left) , Liberty City landmarks (Right) Grand Army Plaza, Brooklyn (Top), Brooklyn Bridge (Middle) Pier A to Liberty and Ellis Islands (Bottom) <i>[By Author]</i>	53
Fig 52	Site Location in City <i>[By Author]</i>	56
Fig 53	Existing Building - Current Facade <i>[By Author]</i>	57
Fig 54	Original Building Facade - photo c 1920 <i>[http://www.jewishottawa.com/display_image.aspx?id=261172]</i>	60
Fig 55	Original Gallery [2nd Floor] Plan <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	61
Fig 56	Original Prayer Hall [1st Floor] Plan <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	61
Fig 57	Original Basement Plan <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	61
Fig 58	Original West Elevation <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	62
Fig 59	Original South Elevation <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	62
Fig 60	1922 [2nd Floor] Plan <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	65
Fig 61	1922 [1st Floor] Plan <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	65
Fig 62	1922 [Basement] Plan <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	65

FIGURE	TITLE AND REFERENCE	PAGE
Fig 63	1930 Front Facade [West Elevation] <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	66
Fig 64	1956 Front Facade [West Elevation] <i>[In Search of Sacred Space The Architectural History of the Synagogue in Ottawa 1892 to Present]</i>	66
Fig 65	Projector installed inside the sanctuary for taking part in digital crusades and other events <i>[By Author]</i>	71
Fig 66	Altar showing the projection screen set up behind it <i>[By Author]</i>	71
Fig 67	Scanstation 3D Scanner on site <i>[By Author]</i>	74
Fig 68	On site sketch of existing building with measurements and notations, South Elevation <i>[Directed Research Studio Documentation Group]</i>	74
Fig 69	Current North Elevation <i>[Directed Research Studio Documentation Group]</i>	75
Fig 70	Current South Elevation <i>[Directed Research Studio Documentation Group]</i>	75
Fig 71	Current 2nd Floor Plan <i>[Directed Research Studio Documentation Group]</i>	76
Fig 72	Current 1st Floor Plan <i>[Directed Research Studio Documentation Group]</i>	76
Fig 73	Current Basement Plan <i>[Directed Research Studio Documentation Group]</i>	76
Fig 74	Current Front Facade [West Elevation] w/ 3D Point Cloud <i>[Directed Research Studio Documentation Group]</i>	77
Fig 75	Current Rear Facade East Elevation] w/ 3D Point Cloud <i>[Directed Research Studio Documentation Group]</i>	77
Fig 76	3D Point Cloud of Exterior and Immediate Context <i>[Directed Research Studio Documentation Group]</i>	78
Fig 77	3D Point Cloud of Interior - Above 2nd Floor Looking East <i>[Directed Research Studio Documentation Group]</i>	79
Fig 78	3D Point Cloud of Interior - Ground Floor Looking West <i>[Directed Research Studio Documentation Group]</i>	79
Fig 79	3D Point Cloud of Interior - Section <i>[Directed Research Studio Documentation Group]</i>	79

FIGURE	TITLE AND REFERENCE	PAGE
Fig 80	3D Point Cloud of Interior - Isometric <i>[Directed Research Studio Documentation Group]</i>	79
Fig 81	3D Perspective Rendering - West and North Facade <i>[Directed Research Studio Documentation Group - Author contribution]</i>	80
Fig 82	3D Perspective Rendering - West and South Facade <i>[Directed Research Studio Documentation Group - Author contribution]</i>	80
Fig 83	3D Perspective Rendering - Context - Looking South on King Edward <i>[Directed Research Studio Documentation Group - Author contribution]</i>	81
Fig 84	3D Perspective Rendering - Context - Looking East on George <i>[Directed Research Studio Documentation Group - Author contribution]</i>	81
Fig 85	3D Perspective Rendering - Context - Arial view <i>[Directed Research Studio Documentation Group - Author contribution]</i>	81
Fig 86	Site Details <i>[By Author]</i>	85
Fig 87	Front Perspective -King Edward Ave Looking East <i>[By Author]</i>	88
Fig 88	Context - King Edward Ave Looking South <i>[By Author]</i>	89
Fig 89	Context - George St Looking East <i>[By Author]</i>	90
Fig 90	Context - Southwest Arial View <i>[By Author]</i>	91
Fig 91	Level 1 Breakdown <i>[By Author]</i>	93
Fig 92	Interior Perspective Ground Floor - Orientation Zone looking South <i>[By Author]</i>	94
Fig 93	Interior Perspective Ground Floor -Worshipping Zone Looking Southeast <i>[By Author]</i>	95
Fig 94	Interior Perspective Ground Floor -Worshipping Zone looking West <i>[By Author]</i>	96
Fig 95	Level 2 Breakdown <i>[By Author]</i>	98
Fig 96	Interior Perspective -Looking southwest into Celebration Zone <i>[By Author]</i>	99
Fig 97	Level 3 Breakdown <i>[By Author]</i>	101

FIGURE	TITLE AND REFERENCE	PAGE
Fig 98	Interior Perspective - Working Zone Looking South <i>[By Author]</i>	102
Fig 99	Interior Perspective -Overseeing Zone Looking West <i>[By Author]</i>	103
Fig 100	Front [West] Elevation <i>[By Author]</i>	105
Fig 101	Back [East] Elevation w/ Transparent Glass <i>[By Author]</i>	106
Fig 102	Side [South] Elevation w/ Transparent Glass <i>[By Author]</i>	107
Fig 103	Ground Floor Plan [Level 1 - Worshipping] Scale approx 1 250 <i>[By Author]</i>	108
Fig 104	Second Floor Plan [Level 1 - Worshipping Level 2 - Celebrating] Scale approx 1 250 <i>[By Author]</i>	109
Fig 105	Third Floor [Level 3 - Overseeing] Scale approx 1 250 <i>[By Author]</i>	110
Fig 106	Visual Study of Exterior - Earlier Iteration of Digital Building <i>[By Author]</i>	112
Fig 107-110	Design Vignettes of Earlier Iterations of Digital Building <i>[By Author]</i>	113
Fig 111	Visual Study of Exterior - Current Iteration of Digital Building <i>[By Author]</i>	118
Fig 112	Visual Study of Great Room - Current Iteration of Digital Building <i>[By Author]</i>	119
Fig 113	Mirror's Edge Pure Time Trial Level 'Flow' <i>[http://mirrorsedgefans.fr/?tag=dlc]</i>	124
Fig 114	LittleBigPlanet Empty Level under construction <i>[http://monstervine.com/2008/07/e3-2008-littlebigplanet/]</i>	124
Fig 115	LittleBigPlanet Completed Level <i>[http://thisweekingaming.wordpress.com/]</i>	124
Fig 116	Maze War on an Imlac PDS-1 <i>[http://www.digibarn.com/collections/games/maze-war/imlacs-pds1-maze/index.html]</i>	130
Fig 117	Screenshot of 'Wolfenstein 3D' <i>[http://www.3drealms.com/wolf3d/]</i>	130
Fig 118	Screenshot of 'Doom' <i>[http://takegame.com/shooter/htm/doom1.htm]</i>	130

FIGURE	TITLE AND REFERENCE	PAGE
Fig 119	CryEngine 3 Logo [http://masterdoomwebs.com/apps/photos/photo?photoId=38887989]	134
Fig 120-121	Screenshots of 'Far Cry', running on the original Cry Engine [http://www.moddb.com/games/far-cry/images/far-cry5]	135
Fig 122-123	Screenshots of 'Crysis', running on the CryEngine 2 [http://www.fanpop.com/spots/crysis/images/722280/title/pics-from-game-photo] [http://www.crysisdemo.com/]	138
Fig 124-126	Jungle and Urban scenes rendered with CryEngine 3 [http://www.incrysis.com/index.php?option=com_content&task=view&id=851&Itemid=1] [http://attackofthefanboy.com/screenshots/crysis-2-show-newer-smarter-enemy-ai/]	140
Fig 127	UDK Logo [http://www.moddb.com/members/danacowley/images/unreal-development-kit1]	141
Fig 128	The evolution of the Character 'Malcom' from the 'Unreal Tournament' Series, showing progress in quality of each iteration of the Unreal Engine [http://en.wikipedia.org/wiki/File:Unreal_Engine_Comparison.jpg]	145
Fig 129-130	Screenshots of the 'Epic Citadel' tech demo of the Unreal Engine on the iOS platform [http://www.epicgames.com/technology/epic-citadel]	145
Fig 131-132	Factory and Jungle Ruins scenes rendered using UDK (Unreal Engine 3.5) [http://www.gamespot.com/forums/topic/27223767]	146
Fig 133	Unity 3D Logo [http://unity3d.com/]	147
Fig 134-137	Scenes rendered using Unity 3D (version 3.4) [http://unity3d.com/]	150

PART I

THE THEORY

Chapter 1 Introduction

The term 'Paraxial' in reference to architecture, was devised specifically for use here through previous iterative studies. It refers to the greek prefix 'para' which means 'beside' or 'distinct from but analogous to, and 'axial', meaning 'of or relating to an axis'. Thus, the term Paraxial Architecture simply means an architecture which exists concurrently to, but is separate from, traditional architecture. In this context, 'traditional' architecture refers to two factions of architectural creation. Firstly, practical architecture or the practice of architecture, that is, the creation of physical buildings, and secondly, theoretical architecture, that is, the creation of purely speculative constructs aimed at questioning or proposing an architectural idea.

Paraxial architecture then, exists beside these 'traditional' architectural fields, in the architecture created by non-architects. More specifically, in the context of this investigation, Paraxial Architecture specifically refers to an emerging type of architecture that is very close to, but definitely separate from our conventional understanding of architecture and its practice. It refers to the architecture of the video-game industry and the entertainment designers who design the environments for use in this field.

The focus of this study is the exploration (and legitimization) of the Paraxial Architecture and architectural spaces created by these entertainment designers, as many of the spaces they have designed have become part of an increasingly popular virtual 'world'. For example, a video-game called the 'World of Warcraft' (a.k.a WoW),

a massively multiplayer online role-playing game¹, has a current population of over 12 million players², all inhabiting the same game world and spaces. This is more than the entire population of Greece. These players spent an average of 23 hours per week³ within the game-world, in virtual spaces and buildings designed by entertainment designers. The purpose for looking at these designers is in an effort to gain an understanding of these spaces designed outside of the field of architecture, and to explore how they might inform the practice of architecture.

Entertainment design is the process in video-games, in which ideas for people, places and things are designed usually through a series of iterative visual representations. However, the most important aspect that separates entertainment designers from other illustrators is that their designs are done with an intent of construction. With this final intent of construction, the motives behind the designs become closer to a traditional architectural understanding of space creation while simultaneously enjoying a freedom of imagination for space creation, unrestricted by physical constraints.

The translation of these drawn spaces into the digital space of video-games, allows for the architectural experience of these spaces to be brought somewhat closer to our everyday reality. This is due to the interactivity between the user and the digital space, as well as the social relationships created by simultaneous inhabitation of the same digital space. The level of inhabitation of these spaces is a trait which on a large scale is unique to video-games and forms the second point of departure between other

¹ A Massively Multiplayer Online Role Playing Game (MMORPG) is a specific genre of Video game in which a very large number of players interact with each other in a virtual game world.

² Information from an official Press release from Blizzard, the makers of the World of Warcraft, dated October 2010. <<http://us.blizzard.com/en-us/company/press/pressreleases.html?id=2847881>>

³ Information from Nick Yee's 2005 WoW Demographics study. <<http://www.nickyee.com/daedalus/archives/001365.php>>

illustrators and entertainment design. That is, the art is not only constructed, but inhabited.

It seems necessary however to frame 'Digital Space' in reference to this discussion, lest it remain unclear. Digital Space is a metaphysical inhabitation of geometry coupled with the interactive ability of exploration. This pairing allows for the hybrid of imagination and geometric definition; although this balance is constantly in flux as the user engages the environment around them. However, as this space relies on a perspectival understanding, it must also be clear that this type of space is not a scientific representation of perspectival space, commonly associated with the 'digital' in architecture. Rather, it is a presentation of digital space. That is, the digital construct is the final product, not a proxy to something other. Thus, it inherently gains experiential, cultural, and social associations that are absent from traditional digital 're'presentations of architecture. This type of inhabited 'digital space' is subsequently referred to as 'hypodigital'. This term was created for use in this study to describe digital space of metaphysical inhabitation, as the greek prefix 'hypo' means 'under the surface', or 'inside'. Therefore, hypodigital means 'inside the digital' and refers to spaces designed with the intention of being digitally inhabited. This idea is opposed to the 'pseudodigital' or digital space of representation. This term, also created for use here is meant to underline the status of the a digital representation as a proxy. 'Pseudo' meaning in-genuine, identifies this type of digital space as an imitation or substitute presentation of another space. This distinction between hypodigital space and pseudodigital space is important to understand to see the worth of studying the hypodigital spaces of games and its creators and their Paraxial origins as precedents for a greater understanding of space making.

However the main goal of this study is not to only mimic the lessons learned from the Paraxial, at the expense of demonizing architectural convention. While adopting this divisive mindset can make for spirited debate, and in many ways could have made this study easier, it is the amalgamation of ideas between the traditional and paraxial that can offer an avenue for a richer understanding of both. By avoiding polarization and allowing these ideas to co-exist, a different and in many ways, more fruitful discourse emerges about architecture, the digital, and entertainment design.

Chapter 2 The Paraxial

It is impossible to talk about the Paraxial in architecture without first talking about traditional architecture. As previously stated, the 'traditional' is made up of two factions, the first being the practice of architecture. That is, the "provision of professional services in connection with town planning as well as the design, construction, enlargement, conservation, restoration, or alteration of a building or group of buildings"⁴ The practice of architecture is concerned with the construction of physical buildings. The 21st Century however, has seen an interesting evolution in the practice of architecture. Today, architects such as Zaha Hadid and Frank Gehry, coupled with the introduction of the computer into architectural practice, are pushing the boundaries of the practice of architecture outward. Regardless of one's subjective judgements on the work of the aforementioned architects, one can look at these architects as inspiration to see what architecture is physically capable of doing and being.

The second faction of the Traditional, is theoretical architecture. This type of architecture is designed solely to demonstrate an architectural theory or idea. It exists only as a representation, although this representation can take many forms, such as a treatise or book, paper project or physical model. In many ways, theoretical architecture has influenced the architectural field more so than its practical counterpart, perhaps due in fact to the ease at which the ideas embedded within it can be proliferated and disseminated.

⁴ What is the Practice of Architecture – as defined by the RAIC - http://www.raic.org/architecture_architects/what_is_practice/index_e.htm

The Paraxial exists between these two factions, and in many ways borrows the best of each. That is, it allows for the speculative imagination and ease of proliferation allowed by the theoretical, while also allowing for a defined and inhabitable construction enabled by the physical or practice of architecture. This in-between existence is then further augmented in relation to the traditional, by the integration of the idea of architecture by entertainment designers. These designers, who are not trained within strict architectural pedagogy, but are still trained designers, offer an alternative view into the design of architecture and the creation of spaces.

Perhaps at the base of the association between traditional architecture and the Paraxial is intent. In the practice of architecture, it is always the intent of the architect that their design be constructed. In entertainment design for video-games, the intent is clear, as each design must be seen as being constructed to become an interactive inhabitable environment or part thereof.

The 'content' is also an important aspect to the Paraxial. Or perhaps, the condition under which the content is created, is a clearer description of the factor which binds Architecture and the Paraxial. This condition is 'purpose'. In traditional architecture, this purpose for creating takes many forms, and as highlighted earlier, can be as complex as the illustration of an architectural theory, or as banal as a paying client who requires a warehouse. In architecture, purpose can also be construed as 'program', the functional or spatial requirements of physical building design. In entertainment design, this 'purpose' follows a similar notion to 'program', as entertainment designers do not create from nothing, but as previously mentioned, are tasked with exploring and representing ideas from others:

Concept designers make the unknown knowable and animate. They render dreams and desires real and tangible. They speak the fluid language of image, fashioning and manipulating the symbols and icons of our collective dreaming, and in doing so, give shape to unknown lands, life to unformed characters, and purpose to unimagined objects.⁵

The product of entertainment design can also be said to have program, as its designs are intended to serve some functional purpose. For games, program is an interesting allusion, as levels are designed with a layering of programmatic intention. On one hand the level must conform to the 'physical' context of the story, and thus the architectural program of the spaces within it are designed as such. For example, if a story occurs in a laboratory, the level must consist of laboratory programmatic spaces for the context to be believed, and would include spaces such as computer rooms, testing areas, clean rooms and specimen storage. This is the contextual program of the space. However, there exists a second level of program to a game level, the gameplay program. This refers to the action the user takes within that space in the game-world, and for which the level was actually designed. What this means is the true *purpose* of the space is not to be a digital computer room as it was designed to appear as, but an enclosed space for a frenzied battle or some other type of action.

⁵ "Foreword", written by Robert Gould in *Concept Design 2: Works from seven Los Angeles Entertainment Designers and Seventeen Guest Designers*. Edited by Anna Skinner. Culver City, CA: Design Studio Press, 2006.

Chapter 3 Entertainment Design

While this study focuses mainly on video-game entertainment design, it is necessary to partly include film in this discussion, as the current profession evolved from its earlier tradition in film. Entertainment design in video-games, while similar in nature to design in film, is subtly different due to the interactive nature of the video-game medium. This forces entertainment designers to be more conscious of their environments as a whole, and must consider what is occurring beyond the limits of the view. They must also be aware of the dual nature of the program associated with their spaces⁶, resolving both aspects into a single design. Many of today's successful Entertainment designers were originally trained in Industrial design, owing to the fact that specific Entertainment design studies and degrees were not offered until at least 3 years ago.

A Brief History

The first use of Entertainment design arose in the early 1970s, where Hal Barwood and Matthew Robbins were developing a science fiction movie entitled 'Galaxy'. They hired the well-known poster and matte painter, Ralph McQuarrie, to help them visualize the ideas in the script. While 'Galaxy' was never realised, in 1973 the pair recommended McQuarrie to the young George Lucas. Lucas, who's project had already been passed

⁶ That is, contextual program and gameplay program, discussed in Chapter 2

over by both United Artists and Universal Studios, needed help selling the ideas for his original treatment of *Star Wars* to 20th Century Fox.

I said 'Look, I want you to do some paintings of these scenes that I've done, so the studio can get a picture of what it is I'm talking about'. When I turned in the script, I had five or six drawings that I turned in with it also, to say: "This is what it's going to look like".⁷

This early work on *Star Wars* was primarily 'environmental' in nature, and mostly addressed the scale and scope of what Lucas was envisioning, more so than the literal 'architecture' of the places which were described in the script. Even though McQuarrie's early concept paintings are 'architecturally' rough, it is inevitable that the architecture of these spaces is defined, by contextualizing the narrative of the story in an image. Effectively, he is designing the 'architecture' specific to the location described in the narrative.

⁷ Quoted from Interview with George Lucas in the Documentary "Empire of Dreams: The Story of the *Star Wars* Trilogy" Dir. Kevin Burns " 20th Century Fox 2004, DVD

Fig. 2-4: Early conceptual paintings by McQuarrie for 'Star Wars'

Today, McQuarrie is seen as one of the grandfathers of Entertainment Design. Born during the depression era in Billings, Montana, McQuarrie was the child of two active painters. He began art classes at the age of 10, and immediately following his graduation, began technical art classes. In 1950 he secured a position at the Boeing Company, where he was the youngest in a 50 person visualization team. There, he honed his craft in mechanical illustrations. Some of his illustrations were used during the CBS live broadcast of the Apollo 11 moon-landings, to explain what was happening hundreds of thousands of miles from the earth. This work for Boeing and NASA was a precursor to his later work in film, and in 1965, McQuarrie moved to California and began free-lancing as an illustrator. During his time in California, he studied at the Art Centre College for Design in Pasadena, where he met Syd Mead.

I looked at Syd Mead's stuff and how do you help but feel a bit intimidated? I liked his stuff from the very start. It always made me want to do better work, but it was inspiration, not competition. I think there's a difference " ⁸

Syd Mead is considered as the other founding father of Entertainment Design. Mead completed his education in Industrial design at Art Centre in California in June 1959 and gained notoriety for illustrating automobiles. This subsequently earned him a job at the Ford Motor Company's Advanced Styling Centre, where he worked for two years. He then moved onto the Hanson Company in Detroit in 1962, a prestigious Industrial design firm at the time.

⁸ Quoted from Interview with Ralph McQuarrie in CGSociety's "Exposé 7 Grand Master - Ralph McQuarrie" by Lorne Lanning and Daniel Wade. Ballistic Publishing, 29 May 2009. http://features.cgsociety.org/story_custom.php?story_id=5083&page=1

Syd was commissioned to illustrate future vehicle scenarios for a variety of corporate clients "The highlight of this time was the complete creative freedom I enjoyed doing the series of advertising books for U.S. Steel, Celanese Corporation, and Allis Chalmers"⁹

In the early 1970s, he founded Syd Mead Inc., where he continued his work in industrial design, where perhaps his most successful venture was his twelve year account with Philips C.I.D.C. In 1979, while still working primarily as an industrial designer, he began his work in film. He teamed up with McQuarrie, who had just completed his work on Star Wars, to work on the film adaptation of the 1960s TV show Star Trek. Arguably his most famous and architecturally specific work came in 1980, following Star Trek, when he began working with director Ridley Scott on his now classic 'Blade Runner'.

Mead was responsible for conceptualizing the dystopian vision of Los Angeles that Scott had described in the script, and Mead's work clearly set the tone for the urban fabric depicted in the movie. The set played an integral role in the thematic and philosophical construct of the film, and of particular interest was Mead's design of the home for the character J.F. Sebastien. Mead approached the design the character's living area and workstation with a similar approach to that of an Architect designing a client's home by attempting to integrate the character's requirements and personality into the design itself.

⁹ Quoted from Interview with Syd Mead in CGSociety's "Expose 6 Grand Master - Syd Mead" by Daniel Wade and Paul Hellard Ballistic Publishing 2010 Pg 9

Fig. 5-7: Production paintings for 'Blade Runner' showing Mead's designs for downtown Los Angeles

Fig. 8: 'Blade Runner' Character J.F. Sebastian's Home and Workstation in the Bradley Building

When designing Paraxial Architecture, entertainment designers walk a fine line between impossibility and believability of their buildings' design. Both are important aspects of a hypodigital architectural construction. So, even though entertainment designers have the ability and capacity to design space to the most extreme possibilities, they generally show some restraint in order to keep the architecture relatable to the player/viewer. Thus this study theorizes that if the player/viewer does not believe the architecture can exist within the context it's being presented, the connection between the player/viewer and the architecture is lost. This idea draws its base from the phase of game development called Playtesting, described by Chris Totten in 'Game Design and Architecture':

Playtesting is a phase of game development where players are brought in from outside the development team to play levels of a video game and confirm the effectiveness of their experiential and spatial qualities. From playtesting, designers can observe and record data on the feelings or emotions of players as they interact with the rule-based systems of the game. According to Dario Casali, level designer at Valve Corporation, "Playtesting is the only way to get from the concept you start with to an execution you are happy with. A concept is only as good as its execution. Playtesting is the only way."¹⁰

What this implies, is that these playtesters are not only testing the rules of the game itself, to ensure it is free of software errors or bugs, but also the conceptual effectiveness of the level design, and by extension, the architecture. Consequently, it implies if the architecture within the game environment is met with resistance by playtesters, it is changed and retested. A similar idea is found in Engineering, called

¹⁰ Excerpt from Game Design and Architecture by Christopher Totten, Pg 5

'Acceptance Testing'¹¹, and in Software Engineering, it is specifically referred to as 'User Acceptance Testing'.¹²

In essence, what this idea means, is that given the situation the player/viewer finds themselves within the narrative of the story, the environment being shown to them must make sense within that situation. This is true of both film and games, as the enjoyment of these media is often tied to a suspension of disbelief. Thus by breaking that suspension, the player/viewer is removed from that situation and is no longer a part of that world but an outsider looking in. This break is especially important to avoid in games, because if the player is no longer able to project themselves into that space and inhabit it, the space is no longer hypodigital. As previously stated without that key level of digital real-time inhabitation, the architecture moves back into the realm of representation. Any space designed on the principals of entertainment design and crafted to be hypodigital constructions must adhere to these limitations. That is, they must take advantage of the design freedom of the hypodigital, for example, the lack of physics and need for structural elements, while simultaneously retaining contextual believability, to keep the connection between the player/viewer and architecture intact.

¹¹ In engineering and its various sub-disciplines, acceptance testing is a test conducted to determine if the requirements of a specification or contract are met. It may involve chemical tests, physical tests, or performance tests. <http://en.wikipedia.org/wiki/Acceptance_testing#User_acceptance_testing>

¹² User Acceptance Testing is a process to obtain confirmation that a system meets mutually agreed-upon requirements. A Subject Matter Expert, preferably the owner or client of the object under test, provides such confirmation after trial or review. <http://en.wikipedia.org/wiki/Acceptance_testing#User_acceptance_testing>

Major Entertainment Designers

Many of today's blockbuster films call for the use of Entertainment designers to develop exotic and alien locations, people, and technology. Design teams for these multi-million dollar productions can be large, and spend months working out all of the design complexities given in each film. Most top-end game studios also employ the services of Entertainment designers in the same fashion as the movie industry, and can also spend months working on the designs of each game. The following are prominent designers within the entertainment industry, with multiple large projects in film and games. Their work is studied not only as architectural precedent, but to understand their process and thinking when designing architecture, in an attempt to understand the similarities and differences between architecture and Entertainment design.

Daniel Dociu

Daniel Dociu is a prominent entertainment designer who works almost exclusively in video-games. As the Chief Art Director for ArenaNet, he was responsible for designing much of the spaces used in the company's premiere title 'Guild Wars', a Massively Multiplayer Online Role Playing Game (MMORPG), where thousands of players simultaneously inhabit the same game world. The game has continually been cited for its "richly detailed and shockingly gigantic world"¹³, no doubt due to the work of Dociu. It is interesting then, to hear him speak of his creative process to Geoff Manaugh, a professor at the University of Southern California who runs the speculative architectural blog BLDGBLOG.

¹³ Guild Wars Review by Greg Kasavin Gamespot <<http://www.gamespot.com/pc/rpg/guildwars/review.html>>

BB First, I'd love to hear where you look for inspiration or ideas when you sit down to work on a project. Do you look at different eras of architecture, or at specific buildings, or books, or paintings – even other video games?

Dociu: Architecture has always made a strong impression on me – though I can't think of one particular style or era or architect where I would say 'This is it. This is the one and only influence that I'll let seep into my work.' Rather, I just sort of store in my memory everything that has ever made an impression on me, and I let it simmer there and blend with everything else. Eventually some things will resurface and come back, depending on the particular assignment I'm working on.

But I look back all the way to the dawn of mankind – to ruins, and Greek architecture, and Mycenaean architecture, all the way up to the architecture of the Crusades, and castles in North Africa, and the Romanesque and Gothic and Baroque and Rococo – even to Neoclassical and art deco and Bauhaus and Modernist. I mean, there are bits and pieces here and there that make a strong impression on me, and I blend them – but that's the beauty of games. You don't have to be stylistically pure, or even coherent. You can afford a certain eclecticism to your work. It's a more forgiving medium. I can blend elements from the Potala Palace in Tibet with, say, La Sagrada Família, Antoni Gaudí's cathedral. I really take a lot of liberties with whatever I can use, wherever I can find it.

BB Of course if you were an architecture student and you started to design buildings that looked like Gothic cathedrals crossed with the Bauhaus, everybody outside of architecture school might love it, but inside your studio –

Dociu: You'd be crucified! [laughs]

BB: No-one would even take you seriously. It'd be considered unimaginative – even kitsch.

Dociu: Absolutely. That's probably why I chose to work in this field. There's just so much creative freedom¹⁴

¹⁴ Excerpt from "Game/Space: An Interview with Daniel Dociu" BLDGBLOG <http://bldgblog.blogspot.com/2008/04/gamespace-interview-with-daniel-dociu.html>

In Dociu's designs, his mixture of material representation with site and scale creates the physically unfeasible. His incorporation of prominent architectural styles allows for the connection and relate-ability of the player-viewer to the architecture. A good example of this is his "Petrified Tree" which is the design for an area in Guild Wars known as Ardorstone. In the story of the game, a curse has turned the forest into stone, and the residents of the area have over the time carved into the stone trees to create dwellings and their city. Dociu uses traditional european architectural elements in a favela-type arrangement to create the personal dwellings higher up the tree, while incorporating elements from gothic churches for the lower trunks, emphasizing the verticality and scale of the forest. All of these elements combine to create a contextually believable but physically impossible construction; a gothic church-tree with european favelas "growing" out of the canopy.

Fig. 9: 'Petrified Tree' - 'Guild Wars' concept for Ardorstone

Fig 10: 'Skybridge' - 'Guild Wars' area concept

Fig 11: 'Floating Mosque' - Personal Study

Fig. 12: 'Guild Wars' area concept

Fig 13: 'Guild Wars' area concept

Feng Zhu

Feng Zhu's resume includes both blockbuster films and triple-A games, and his broad design skill has allowed him to excel in all facets of his craft. Perhaps the most interesting thing about Zhu is his training. On first glance, it appears that he attended only the Art Centre College of Design in Pasadena, like most prominent entertainment designers. However on a closer inspection, he also received a traditional training in architecture at the University of California's Berkeley's Campus. While information on Zhu's time at Berkeley is limited, he says himself he did not complete his architectural degree, due to the design 'limitations' expected within the traditional architectural pedagogy.

I got in trouble a lot in college, too I actually went to UC-Berkeley for architecture because my parents, being Asian, didn't really understand [the entertainment design] world—most people don't. They go, "You're going to draw, you're going to starve" So I thought maybe I'd try architecture, and there (UC-Berkeley) I got in a lot of trouble for doing designs that weren't meant for architecture, because I'd draw weird spaceships and things like that. They want very traditional things. So I dropped out of there and pursued my dream to do films.¹⁵

However, one can argue his style appears to be somewhat more 'architectural' than his counterparts such as Ryan Church, especially evidenced in his environment and building concepts, and can perhaps be attributed to his time at Berkeley. Zhu started first in the game industry, where he first worked at Electronics Arts' Austin offices, on an ill-fated online version of 'Wing Commander'. He received critical acclaim for his work with EA on BloodRayne, and after a year, moved onto the production company Blur, famous for its work on game cinematics. Zhu's 2 years at Blur would

¹⁵ Excerpt from "The Screen Savers Ten Minutes with Feng Zhu" G4TV <http://www.g4tv.com/articles/51346/ten-minutes-with-feng-zhu/>

allow or him to get the exposure in film he would need to eventually get an invitation in 2002 to join George Lucas at Skywalker Ranch in Marin County, California. There Zhu would work on Star Wars, Episode III: Revenge of the Sith:

For concept design, that's probably the film you want to work on because everything needs to be designed in this movie. It's all original stuff. It was a lot of fun working on this film. I grew up with all these movies, and to work on the last one is especially fun¹⁷

Today Zhu not only continues his design work, but is committed to the evolution and growth of the entertainment design industry across the world. In 2004 he partnered with the Gnomon Workshop, producing their first Industrial/Entertainment Design training DVDs. The DVDs were exceptionally well received, and today are used as teaching material in design schools across the world. He continued teaching both through Gnomon Workshop Instructional DVDs and at his alma mater, the Art Centre College of Design. His teaching culminated in the opening of the Feng Zhu School of Design, located in Singapore, in an attempt to bring high quality entertainment design teaching to Asia. While the school offers full time diplomas and professional courses to paying students, his commitment to the development of the industry is not only evidenced by the location, but his use of modern social technology like Facebook, Twitter and Youtube to share much of the School's teachings and work with the general public. Specifically, the School's "Design Cinema"¹⁶ series on Youtube, feature FZD faculty, including Zhu himself, showing in-class demonstrations, coupled with commentary, to take the viewer through various facets of entertainment design. While these videos cannot substitute for full-time entertainment design training, Zhu's openness to share much of his school's materials generate not only interest in the school, but for the industry in general.

¹⁶ FZD School of Design, Design Cinema Series on YouTube <http://www.youtube.com/user/FZDSCHOOL#p/u/119/1XONpd5REQw>

Fig. 14: Building Concept - FZD in class demonstration

*Fig. 15: Architecture/Supership Variations
FZD in class demonstration*

Fig. 16: Enemy/Alien Architecture - FZD in class demonstration

*Fig. 17: Architecture and Lighting
FZD in class demo*

Fig. 18-23: Environment/Architecture Variations - FZD in class demonstrations

Ryan Church

Ryan Church is one of the most prolific Entertainment Designers working today. His resume includes some of the biggest blockbuster films of the last decade, including Avatar, Star Trek, Transformers 1,2 and 3, and War of the Worlds. Perhaps his most famous work is on the Star Wars prequels, where he was Chief Art Director of the entire Entertainment Design team at Skywalker Ranch during pre-production of Episodes 2 and 3. While Church's work on Star Wars focused mostly on character and vehicle designs for the films, his architecture in many ways is made interesting because of his industrial design focus. Unlike Zhu, Church's designs reflect a more organic feel, borrowing heavily from forms of the body and nature. That being said, his most prominent work in video-games, the critically acclaimed 'Dead Space' (released in 2008) is not a prime example of his organic architectural style, however he is still able to imbue certain parts of the design with his trademark. It is unclear however if these portions were kept in the final game, nevertheless his work on keeping each area of the the hypodigital space of the game unique is cited as one of the games strongest features.

Lots of care has been poured into the Ishimura's design, and despite the action taking place almost entirely on one ship you're never left pining for a change of scenery. The Ishimura is segregated into various decks and labs, each with a distinct palette.... Exploring or even re-exploring the decks is a nail-biting experience, driven forward by the film-worthy script and inspired setting. It's Rapture in space: every bit as disturbing, just as meticulously designed and easily as believable.¹⁷

¹⁷ Excerpt from Dead Space Review on the Xbox360 by Matthew Pellet Gamesradar <http://www.gamesradar.com/xbox360/dead-space/review/dead-space/a-2008101413721934082/g-20070924145143734032/p-2>

The comparison of the design of the game's ship the 'Ishimura' to 'Rapture', the now-famous underwater art-deco city of the game 'Bioshock' released in 2007, is high praise. At the time, the City of Rapture was seen as a benchmark of hypodigital urban design, as it successfully married a recognizable architectural style, with physical impossibility and contextual believability.

Fig. 24: 'The Artifact' - Dead Space

Fig. 25: 'The Clinic' - 'The Ishimura' Interior - Dead Space

Fig. 26: Dead Space area concept

Fig. 27-29: Mygeeto Architecture - Star Wars Episode III

Fig. 30: Sinkhole Architecture - Episode III

Fig. 31: Bridgeworld Architecture - Star Wars Episode III

Fig. 32: Starfleet Academy Lecture Hall - Star Trek

Antonov was born in Sofia, Bulgaria and moved to Paris at 17. A long time doodler, he was accepted at first at Art Centre Europe (which was closed in 1996) before relocating to California and completing his training at the Art Centre in Pasadena in 1996. Antonov's most publicly famous work is on the Valve Corporation's video game Half Life 2 (released in 2004), where he was the Principal Art Director for the entire project. While his work on the project is scarce, what is available shows the level at which his original drawings ended up in the final game. This is not just in terms of the architecture of the environments, but also the mood and lighting. As such, He is credited with much of the look of the game itself, which has received high praise

It is not simply that the surfaces, textures and light effects push the technical envelope without mercy, but that such care and artistic flair has gone into designing them. The haunting, grim landscapes become strangely beautiful¹⁸

It can't be overemphasized how spectacular the whole thing looks, with a physical presence to the environment that's no longer restricted by the box-like level designs of old - a majestically constructed environment that above or below ground, inside or out, hits new heights of artistic excellence that make every potentially mundane step of your journey an eye-popping feast to savour¹⁹

While the game launched in 2004, it is still lauded for its designs. The most notable architectural element of the game is City 17, and the alien stronghold in the centre of the city called the "Citadel". It is described as being identifiably alien within the context of the city, just from the contrast of the architecture. This excerpt from Jim Rossignol's

¹⁸ Quoted from James Bregman "No half measures with Half-Life 2" BBC News <http://news.bbc.co.uk/2/hi/technology/4025515.stm>

¹⁹ Quoted from Kristan Reed "Half-Life 2 Review" Eurogamer http://www.eurogamer.net/articles/r_half-life2_pc

“Evil Lair: On the Architecture of The Enemy in Video-game Worlds” specifically highlights Antonov’s designs in Half Life 2 as particularly interesting:

Where the evil lair becomes a little more interesting is when its nature is ambiguous – but nevertheless disturbing. Half-Life 2’s Citadel is an example of this. The brutal gunmetal skyscraper that looms over a nameless Eastern European city, below, appears deeply threatening. But, like everything else in the Half-Life 2 universe, it is unexplained. It does not seem inherently evil. The structure moves and groans, it is a machine of some kind. It is something constructed and mechanical, rather than the clear manifestation or emanation of an evil force. The Citadel is not a fire-rimmed portal to hell, nor a windswept ruin. Nor is it a volcano base. It could even be somehow utilitarian. In fact, it’s reminiscent of the real Moscow’s own television tower.

It is, perhaps, even incidental to the scourge that Half-Life’s denizens face: alien infrastructure. It is only later, as the plot uncoils the inner architecture of the Citadel, that you come to realise that it is the enemy: the lair of an alien force that must, ultimately, be destroyed.²⁰

This is an interesting notion that can only exist within a paraxial architecture and hypodigital space, the idea that the architecture itself is an object beyond simply a building. In this case, it is more than simply the house of the enemy, it is the enemy itself.

While much more famous for his work at Valve on Half Life 2, Antonov’s work in the cancelled video-game ‘The Crossing’, which is set in a fictionalized sci-fi Paris, is also of note. What is perhaps most interesting about this work, is how he conceptually breaks Paris down into simplified architectural ideas. He then uses these architectural

²⁰ Excerpt from “Evil Lair: On the Architecture of The Enemy in Video-game Worlds” by Jim Rossignol. Guest Post on BLDGBLOG <http://bldgblog.blogspot.com/2009/05/evil-lair-on-architecture-of-enemy-in.html>

ideas as a base on which to warp his designs into a sci-fi construction, yet still have it be recognizably Paris

Antonov approached the problem by altering just a few parameters in the standard architectural model. For instance, Antonov had noticed a few fundamental details about how the mid-nineteenth century neoclassical core of Paris had been constructed: big street-level floors, smaller attic spaces, complex chimney stacks. By increasing the emphasis on the lower floors, and stretching them out—and by emphasizing the height and complexity of the chimneys—Antonov was able to create a thematically consistent science fiction Paris.

Simply by altering a few basic architectural parameters, he said, you were able to fictionalize the city, whilst at the same time retaining its fundamental identity. His designs were still recognizably—even mathematically—Parisian, in other words, but they were also otherworldly.²¹

This is also another interesting notion that could not only inform the design of hypodigital spaces, but also traditional architectural spaces. In looking at architecture in this way, one could then appropriate the methodology of his approach to Paris for perhaps a way to look at and tackle the design of adaptive reuse of old heritage buildings. By breaking down the architecture into manipulatable elements, one can then re-arrange, augment and change these elements, while still maintaining the recognizability of the original structure. While Antonov's methodology could not be used for all buildings and cities, it is yet another example of a possible paraxial approach to the design of architecture.

²¹ Excerpt from "Procedural Destruction and Algorithmic Fiction of the City" by Jim Rossignol. Guest Post on BLDGBLOG. <http://bldgblog.blogspot.com/2009/08/procedural-destruction-and-algorithmic.html>

Fig. 33: 'The Citadel' - Half Life 2 Concept Painting

Fig. 34: 'The Citadel Interior' - Half Life 2 Study

Fig. 35: The Crossing - Overworld Study

Fig. 36: The Crossing - Overworld Study

Fig. 37: The Crossing - Overworld Study

Chapter 4 Digital Space

As stated in the introduction, this study relies heavily on the idea of “Digital Space”, but more specifically, hypodigital space. The delineation between digital representation in architectural practice, or pseudodigital space, and the inhabited construction of hypodigital space is important to situate this study within a broader discourse. In researching this study, it was noted many of the criticisms of the use of the computer in architectural practice revolve around pseudodigital space and thus, while closely related, do not specifically apply to the use of the computer in this study. Furthermore, this study should not be seen as a blanket remedy for all of the computer’s shortcomings in relation to architectural practice, but instead as one of many alternative approaches to its use. Again, the most important departure for the idea of hypodigital space is the premise that hypodigital space is not a representation.

The hypodigital construct is then a presentation of space, the final product and not a proxy to something other. Thus, it is the ‘building’, it is the architecture, it is the construction, and although it exists within a digital environment, that existence is not diminished, only different. Perhaps then, the most interesting part of hypodigital space is that it does not truly ‘exist’ until it is inhabited. Unlike physical space, whose physicality allows it to stand forgotten and uninhabited, hypodigital space exists in its final form only when one enters that space through the window of the computer screen.

The ability to explore, dwell and inhabit hypodigital space, plays a huge part in its legitimization as an architectural construction. It allows for both the digital geometric definition of the architecture, and the capacity for spatial discovery and

imagination. In other words, because the user engages the hypodigital space at a human scale, the entirety of that space is unknown, similar to entering an unfamiliar physical building. Thus the understanding of the hypodigital space is defined by the users imagination, driven by what the user first sees. That is, the user fills in the unknown hypodigital architecture using a spatial 'instinct' derived from a knowledge of physical spaces. Concurrently this is why the design of the space must be relatable to the user and contextually believable as previously stated, as the user must rely on that learned spatial instinct at first. However as the user explores, the unknown is replaced with a geometric architectural memory, allowing for the user to 'see' or understand the digital space beyond the immediate confines of the computers window.

Importantly, hypodigital space must allow for more than this initial discovery, lest it become a pale interpretation or representation of the experience of actual physical space. This as a shortcoming, needs be addressed through the architecture itself. As physical forces in hypodigital spaces are only simulations, they have the ability to be controlled and changed, creating experiences unique to the hypodigital. The most notable of these forces is gravity, but other forces, such as reactionary force²² are also manually assignable. This negates the need for the understanding of architecture through structural systems. The design is then opened to different limitations compared to the physical, which allows for a different set of experiences. Hypodigital space also allows for a re-imagining, changing or overhauling of its architecture at any time. Unlike the physical, which in many ways is resistant to change, hypodigital space can encourage or embrace change. As the needs of the occupants change, so to can the hypodigital space, reacting with an update or

²² *reactionary forces refer to Newton's third law of motion in physics, where every action has an equal and opposite reaction* What this means, is that the physical parameters of objects can be set manually to allow for user/players to be able to pass entirely through them (no reactionary forces), or be elastically repelled (high reactionary force), regardless of the object or material. It also refers to the reactionary forces of objects with high or low masses. In the physical world, objects of high mass are not easily moved due to a high inertia. In hypodigital spaces, mass is user-definable value, for example, allowing for large 'boulders' to have the mass of a cardboard box, and vice versa

alteration to the space itself. These changes can range from real-time immediate spatial 'animations', to an entire update or reworking of the digital model of the space. Spatial 'animations' allow for the transforming the building around its inhabitants via commands, depending on the current uses of the space; while updates to the model would only take effect offline²³ and would only be apparent once users re-entered the updated space.

With hypodigital space, the line between the architect designing and the 'contractor' making or building that design, becomes blurred. While the line still exists, and can be delineated at the point at which the design is transferred from the tool of digital creation (a 3D modeling application) to the tool of digital 'building' (a game-engine²⁴) the ability for the designer to 'test' the inhabitation prior to its final design iteration is the mechanism through which that blurring occurs. In game design, this critical mechanism is called 'Play-testing'. Not only is this a regular practice in the game design world, but the designers often bring in objective outsiders to test their levels and spaces, to see if the design is working as intended.

Hypodigital space allows for more of a 'spatial evolution' than a temporally defined building, thus 'play-testing' is always ongoing, even after the hypodigital building is first digitally constructed. However, the tool used for building hypodigital space for inhabitation, that is the 'game-engine', can also be used in traditional practice as a mechanism for pseudodigital space. In this way, it represents a physical construction, but still allows the designer the ability to 'play-test' the eventual physical space as a pseudodigital environment.

²³ That is, the building would be inaccessible to users during the update, much akin to the periodic downtime of internet websites due to scheduled web server maintenance

²⁴ A game-engine is a software system designed for the creation and development of video games. It allows for game creation to be more akin to other digital creative fields such as computer animation, and reduces the need for large amounts of custom programming to make the game run. For a more detailed definition, history and evolution of the game-engine and game technology, please see Appendix A: Game Technology at the rear of the book.

Examples and Applications

Using a game-engine in traditional architecture, is example of using Paraxial methodologies to generate alternative avenues for the exploration and creation of traditional architecture, in an attempt to use the tool of the computer to propose a more meaningful and participatory urban space. By play-testing physical spaces prior to their physical construction, the architect is able to ensure not only that the design is working as he intended, but also allow for the client and contractors to see and approve the design before construction begins.

While gaming technology is the vehicle used for constructing and inhabiting hypodigital space, it was found in researching this study, that it *is* used within the architectural profession (albeit sparingly) for these types of pseudodigital representations. In March 2007, one of the largest architectural firms in North America, HKS, purchased a full developer's license to the Unreal Engine 3 from Epic Games²⁵. With this technology, they developed their proprietary tool ARCHengine, which they describe as a "Real-time architectural discovery application"²⁶. While HKS' intention was never to craft hypodigital space using the tool, the ability for a realtime inhabitation of yet unbuilt projects influenced some of the designs.

Some of the projects ARCHengine has been used on include the new \$1 billion Dallas Cowboys stadium and the W Dallas Victory Hotel. In the stadium project, team officials were allowed to virtually sit in each of 89,000 seats in the stadium to give the owners a realistic sense of their \$1 billion investment—not to mention the opening and closing of the site's 660,800-sf convertible dome. For the W Dallas, potential buyers of \$1 million condos were allowed to see

²⁵ For More information on the Unreal Engine, Please see Appendix A Game Technology

²⁶ Quoted from 10 03 07 dated news post on HKS Inc's ARCHengine Website [http // www archengine org/](http://www.archengine.org/)

the actual view of the Dallas skyline from any of the residential units in the project. They could also visit the Ghost Bar on the top floor and other building amenities.²⁷

HKS also intends to expand the use of the technology within the firm, as well as incorporate newer improvements to the engine and streamlining the process. Their work should allow for quicker turnarounds of the representations within the digital-environments.

As Epic has improved on its Unreal technology, HKS has continued to build its own custom tools that allow its in-house team to translate the 3D models of its building projects seamlessly into the UE3 world, getting the textures and lighting right. Carmichael said that over the next 18 to 24 months, as the company integrates the new Autodesk REVIT technology across all of its projects (this software translates 3D models into 2D drawings), UE3 will be used for real-time visualization for every building. The goal is to have all 200 design presenters using UE3 for pitch meetings within two years.²⁸

²⁷ Excerpt from Article "HKS Licenses Game Engine For 3D ArchEngine" by Jeff Yoders. Building Design + Construction Website. <http://www.bdcnetwork.com/article/hks-licenses-gaming-engine-3d-archengine?page=2>

²⁸ Excerpt from Article "Cowboys Stadium: Unreal Engine 3 Brings Architecture to Life" by John Gaudiosi. Unreal Technology Showcase. http://www.unrealengine.com/showcase/visualization/cowboys_stadium/

Fig. 38-39. Screenshots of Cowboys Stadium in ARCHengine

In researching hypodigital space described in this study it was also discovered that this proposal was not the first attempt at using Digital Space in this way. The recently “opened” Adobe Museum of Digital Media designed by Filippo Innocenti is described as a ‘Virtual’ Building. This idea reflects much of the idea of hypodigital space as described in this study. Innocenti was challenged to define what a ‘Virtual’ building was, early on in the design process:

It was quite a precise moment when we realised that doing something virtual wasn’t that easy in the end, so we had to go back and try to see the museum as something more credible, more physical.²⁹

this idea of crafting the virtual to be “more physical”, is similar to the idea of the user of the hypodigital space needing the space to be relatable to their spatial memory based on physical structures, as discussed earlier. It is clear the intention of the Adobe Museum of Digital Media is to craft a hypodigital space, as can be seen by the invitation by Ann Lewnes, Senior Vice President of Global Marketing at Adobe:

We encourage you to roam through the halls, and interact with all the exhibits: there are no guards here and we are always open.³⁰

However, a visit to the museum itself shows that the space is in fact, a pseudodigital space. While it is true, Adobe’s ‘Virtual Building’ does adhere to some of the requirements to fulfill a true hypodigital space, the attempt however falls short, due to the fact that the navigation of the building itself is reliant on pre-rendered cinematics. This does not allow for the freedom of movement and exploration that is implied by

²⁹ Quoted from Filippo Innocenti, From Video ‘Making the Impossible’ in the Adobe Museum of Digital Media <http://www.adobemuseum.com/index.php>

³⁰ Quoted from Ann Lewnes, from Video ‘Making the Impossible’ in the Adobe Museum of Digital Media <http://www.adobemuseum.com/index.php>

Lewnes' invitation. *Indeed, even the current exhibitions and lectures themselves are removed from the context of the virtual building and in many ways are "site-less", and thus bear no connection to Innocenti's construction. This renders the use of the 'virtual building' almost moot, considering the exhibitions and lectures are only alluded to exist within the building, but are not explicitly there. It can be argued however, that perhaps a true hypodigital space may not be appropriate for the exhibition of 'digital art/media' as defined by Adobe and the Museum curators. Nevertheless, it remains an interesting attempt at the use of a hypodigital-like environment which adds to the discourse on the use of Digital Space in architecture.*

Fig. 40: Adobe Museum of Digital Media - Exterior

Fig. 41: Adobe Museum of Digital Media - Interior

Fig. 42: 'Uncanny Valley' Exhibition - Adobe Museum of Digital Media. The exhibition takes place in a site-less black void.

True hypodigital spaces offer possibilities that cannot exist otherwise. One such example was touched on earlier in Chapter 3, the idea of living architecture, or architecture that is more than just a building. While the Citadel in Half-Life 2, designed by Viktor Antonov was given as an example, the colossi from the video-game "Shadow of the Colossus" (released 2005) stand as an even greater example of this notion. Half animal, half architecture, the Colossi could only exist as hypodigital constructions.

But perhaps the most extraordinary and unearthly of evil video-game architectures are the wandering colossi of *Shadow of the Colossus*. Great, living structures, lonely behemoths, that stride magnificently across the game world. These sad, shaggy giants of stone and moss must be climbed and slain by the hero, often via use of the surrounding environment of ancient ruins and meticulously designed geological formations. Lairs within lairs.

Of course, monsters are *presumably* evil, but the reality of the colossi remains ambiguous for much of the game. When the game is up, the player-character suffers a terrible price for destroying these strange, animate monuments. It is one of the few video-games in which the protagonist dies – horribly and permanently – when the game is over. It is a game where destroying the evil lair might well have been the wrong thing to do. And yet it is all you can do³¹.

³¹ Excerpt from "Evil Lair: On the Architecture of the Enemy in Videogame Worlds" By Jim Rossignol. Guest post on BLDGBLOG: <http://bldgblog.blogspot.com/2009/05/evil-lair-on-architecture-of-enemy-in.html>

Fig. 43: Colossi Concept sketch - 'Shadow of the Colossus'

Fig. 44: Colossi in Game - 'Shadow of the Colossus'

The game won numerous awards, specifically for its designs, beating out the much more popular 'God of War' in the 2006 GDC Awards.³² It is also often used as references in the ongoing debate on the moral, thematic and emotional possibilities that can exist within video-games. Of course, the idea that moral ambiguity and emotional responses exist within these game worlds, is a testament to the idea that they are in fact, legitimate constructions in which people have genuine experiences. While the experience may be tailored in many instances such as Shadow of the Colossus, MMORPGs (Massively Multiplayer Online Role Playing Games) such as the World of Warcraft, EVE Online, or Guild Wars are not. These worlds allow for even a greater level of player immersion in that there is no end to the story, the player may play indefinitely.

Concurrent to the World of Warcraft or Guild Wars, 'Second Life' was first released in June 2003 and developed by Linden Labs. Linden Labs does not describe Second Life as a game, instead referring to it as a "3D Virtual World, where users can socialize connect and create."³³ Architecture in Second Life however, for the most part is based on physical architecture, and thus the vast majority does not take advantage of the digital environment. Instead, in game avatars called 'residents' live out a digital version of real life, needing to work for or buy Linden Dollars, to be a functioning member of the Second Life society. While the population of Second Life appears on the

³² Shadow of the Colossus won in the Categories Visual Arts, Game Design, and Character Design, as well as the coveted Game of the Year at the 2006 Game Developers Choice Awards. It's victories were surprising, given the popularity of the Sony made title 'God of War'. Detailed in "Colossus casts shadow over GDC Awards" by Tor Thorsen and Curt Feldman. Gamespot. <http://www.gamespot.com/ps2/adventure/wandaandthecolossus/news.html?sid=6146480>

³³ Quoted from the Second Life Website <http://www.secondlife.com>

surface to be as robust as the *World of Warcraft*, actual long-term users inhabiting the world appear to be a fraction of that number.³⁴

Other interesting use of Hypodigital space is seen in the puzzle video-game 'Portal' developed by the Valve Corporation and released in October 2007. Its unique gameplay is a result of the idea that the in-game architecture is the puzzle that must be solved. While this idea in itself is not unique, it is made unique because of the game mechanic³⁵ of portals that must be used to navigate the architecture. This makes the experience of the architecture unlike any thing physically possible, and forces the player to view and understand the architecture differently.

³⁴ Daniel Terdiman of CNET News, speculated the Second Life long-term residents (that is, those who are active members of the Second Life community) at 1/10 the signup number reported by Linden Labs. He suggests that many Second Life accounts are simply users who sign up, try it once, and leave forever, and cannot be counted amongst the actual in-game population. http://news.cnet.com/Counting-the-real-Second-Life-population/2100-1043_3-6146943.html

³⁵ A game mechanic is a set of rules, or system set up to produce a particular effect or type of gameplay. Oftentimes it is associated with the main action of the game. For example, in *Super Mario Bros.* for the Nintendo Entertainment System, the main game mechanic would be 'Jumping'. For more information on game-mechanics see Chris Totten's "Game Design and Architecture" Chapter 2 'Parti vs Core Mechanic'.

Fig. 45: Portal - In game screenshot

Fig. 46: Portal - Frontispiece

Hypodigital cities offer yet another interesting avenue of discussion in Digital Space. Perhaps the most interesting of the games with this type of space is 'L.A. Noire' released in May 2011. The game was developed by Team Bondi in conjunction with Rockstar Games and is set in Los Angeles of 1947. The game's innovations in character animation are also groundbreaking, opening the doors for games to offer greater interactive experiences not only with architecture but with people within the architecture. However, the most significant to this discussion is the ability to navigate and inhabit a 'real' city (Los Angeles) but in the past. The hypodigital city thus creates an intriguing situation of spatial memory. As the player becomes familiar with 1947 L.A. the spatial understanding learned from traversing the hypodigital city could then translate to the physical city of current Los Angeles. In this way, L.A. Noire builds on these ideas and questions that originally surfaced in Liberty City, the fictionalized New York City of Grand Theft Auto IV. However, Liberty City, is more than simply a pure representation or pseudodigital manifestation of New York, its alterations make it a city unto itself. This idea is clarified by Jim Rossignol in his article "The Inevitability of Prophecy Among Models of New York" for BLDG BLOG:

New York city has become gaming's ideal and idealized urban environment, and it has done so by becoming refictionalized and reimagined. The finest example of a city yet given to gaming, that of Grand Theft Auto IV, isn't really New York at all, and yet it is more like New York than ever before. It's the essence of New York—a distillation that is only possible thanks to the unique way in which games are able to make the figurative and the abstract resonate with us even more profoundly than the infinite detail of the everyday ³⁶

³⁶ Excerpt from "The Inevitability of Prophecy Among Models of New York" by Jim Rossignol. Guest post on BLDG BLOG <http://bldgblog.blogspot.com/2010/11/inevitability-of-prophecy-among-models.html>

As previously stated however, the spatial understanding learned from traversing Liberty City can translate to the physical city of New York. Even less-famous or everyday places and landmarks, become far more recognizable due to the memory of its doppelgänger within Liberty City. This becomes an interesting twist on hypodigital space, as hypodigital space initially relies on a spatial memory of the physical.

Fig. 47: L.A. Noire - Screenshot

Fig. 48: Grand Theft Auto IV- Screenshot

*Fig. 49- 51: Real life landmarks (Left) , Liberty City landmarks (Right)
Grand Army Plaza, Brooklyn (Top), Brooklyn Bridge (Middle) Pier A to Liberty and Ellis Islands (Bottom)*

PART II

THE PROJECT

Chapter 5 The Existing Building

Introduction

While the first part of this thesis covered the idea behind Paraxial architecture and hypodigital spaces, this second portion covers the application of the ideas explored in part 1. The reason for splitting this study into these sections, instead of weaving the application of the ideas into the discussion of the ideas itself, is in an attempt to separate the application from the ideas in a way that made clear that this application is only one application of a much broader discourse on entertainment design, hypodigital space, game technology and paraxial architecture.

This proposal however, differs as it has been pushed toward the realm of the hybrid paraxis, that is, the 'building' proposed is a subversion of our own traditional practice and the paraxial world of entertainment design, discussed in part 1. The intent of this subversion is to examine the ability for both of these design instances to co-exist and inform each other, through a series of overlaps that will be further discussed in Chapter 6 'The Proposal.'

Fig. 52: Site Location in City

Fig 53 Existing Building - Current Facade

A History of the Building

The Jewish community began in Ottawa in 1859 with the arrival of Moses Bilsky, Ottawa's first Jewish citizen. As other Jews arrived in Ottawa in the ensuing years, it would be around Bilsky that they would build their community and stabilize their culture within the urban fabric. Originally, this early Jewish community met within member houses, with learned scholars leading the congregations in lieu of a formal Rabbi. However, as the congregation grew, they officially established themselves as the Adath Jeshuroon congregation in 1892, a name which underwent numerous reinterpretations as they attempted to romanize the traditional Hebrew spelling. The ever expanding Adath Jeshuroon congregation soon grew too large to fit inside member homes, and they established a temporary Adath Jeshuroon Synagogue on Murray Street in 1895. This wooden building on Murray St acted as their meeting place for nine years, until a more permanent structure was constructed on 375 King Edward Avenue to replace it.

The building was originally constructed in 1904, by the then prominent Ottawa architect John H Watts. Its original dimensions were detailed in a Ottawa Citizen article the day of its opening:

The new house of worship will be 40 ft by 66ft, three stories high with school accomodation in the basement, and will cost in the neighboburhood of \$12,000 ³⁷

³⁷ "The Citizen" - Tuesday July 26th, 1904 Pg 10
The 2010 value of \$12,000 in 1914 (10 years after construction in 1904) is \$231,147.54

The building's original plan and overall proportion was characterized by its similarity to eastern european synagogues, in an effort for the new immigrants to feel a hint of connection to their old traditions and culture of their motherlands. However, this desire was simultaneously offset by thier need for integration into their new surroundings in Ottawa, and perhaps was the reason for hiring John Watts as a mediator for this integration. However, notes uncovered by Hagit Hadaya³⁸ on this early period in Ottawa's Jewish history show they may not have been entirely convinced of the architectural success of the building:

Architecturally it corresponds with paying homage, a debt before a certain freedom can be achieved. It is a step that has to be taken or accomplished before proceeding with peace of mind to greater cultural achievements. However this process is never done quite satisfactorily because: - the means are modest, - the competence is inadequate because there is a lack of designers and builders within the ethnic group; - other interests or preoccupations are present (socio-economic concerns)

Historical Notes as well as Historical Drawings of 375 King Edward in this theses were extracted from Hagit Hadya's Thesis for Master of Arts in Canadian Studies 'In Search of Sacred Space: The Architectural History of the Synagogue in Ottawa 1892 to Present' Carleton University, 1992, Ottawa Jewish Archives

Fig. 54: Original Building Facade - photo c. 1920

Fig. 55: Original Gallery [2nd Floor] Plan

Fig. 56: Original Prayer Hall [1st Floor] Plan

Fig. 57: Original Basement Plan

Fig 58 Original West Elevation

Fig 59 Original South Elevation

In 1910, the Adath Jeshroon congregation somewhat expanded their presence in the Ottawa community with the construction of a small Jewish Institute on the East end of the 375 King Edward property. This Institute was to act in conjunction with the space in the Synagogue's basement, offering afternoon schooling to the communities youth, as well as functioning as an overall youth centre for the community. This building however does not survive today, and its exact date of demolition is unknown.

Some ten years later in 1920, the congregation made plans to expand the main synagogue building, primarily to accommodate a greater congregation. In Minutes dated March 16th 1920³⁹, a special meeting of the congregation's building committee was held to overlook the final construction tender and sign the construction documents. In this meeting, the architect is named as Allan W. Horwood, and the construction budget valued at \$14,500 (\$150,774.34 in 2010). This expansion would add 2 additional bays to the east end of the synagogue, to the building's current 6 window bay depth and an apartment to the basement, specifically for the building's caretaker. This expansion was completed in 1922.

The last revision occurred in 1930, by architect Cecil Burgess. In this revision, the building's original flat roof was replaced with a gable, allowing for an interior barrel vault to be added. Also, the final major facade element of the ornamental gable end, with the large star of david was also added in this revision, in addition to the replacement of the original facade entry doors to two twin doors with stars of david. This revision would bring the facade to its current state (with the exception of the final door alteration, which converted the pair of twin entry doors to a single set of twin doors, with adjacent windows, which occurred sometime after 1956) This revision also

³⁹ Ottawa Jewish Archives, Congregation of Adath Jeshurun, Minutes Series (1892-1956) V 3

included interior modifications to the seating chart by way of removal of the original Bimah, and the construction of a new platform on the east end of the church to serve those purposes. A minor revision in 1935, which consisted of the addition of 2 fire escapes from the second floor would bring the building to it's current architectural condition.

Fig 60 1922 [2nd Floor] Plan

Fig 61 1922 [1st Floor] Plan

Fig 62 1922 [Basement] Plan

Fig 63 1930 Front Facade [West Elevation]

Fig 64 1956 Front Facade [West Elevation]

However in 1956 the building's Adath Jeshuroon congregation consolidated with the Agudath Achim congregation at 151 Chapel St, into the new Beth Shalom Congregation. This new congregation then commissioned a new synagogue to house their services, and upon completion of the Beth Shalom Synagogue, the building at 375 King Edward was sold to the Hevrah Kadisha congregation and repurposed as a Jewish Funeral Chapel. It would keep this function for just over 40 years, when it would be sold to the Seventh Day Adventist Church in 1999.

Interestingly the Adventists have not done much physically to the church, save for the installation of modern equipment such as projector and satellite equipment (the use of which will be subsequently discussed), and the alteration of the church's 'alter' to include a full immersion baptismal font under the floor, as per their religions beliefs on baptism. All over the 'new' church, signs of the old Jewish community still linger, with stars of david and intricate jewish symbology still existing on the doors, lights, windows and railings, with no clear intent by the new tenants of removing these symbols.

The New Tenants: The French Seventh Day Adventist Church

Much of this project in fact gains traction when viewed through the lens of the Seventh Day Adventist faith. The Church was founded in 1863 by Joseph Bates, James White, Ellen White and John Andrews⁴⁰. Beliefs of the Seventh Day Adventist Faith are similar in nature to other versions of Protestant Christianity, but are held to a core set of 28 fundamental beliefs that are detailed as “descriptors not prescriptors that is that they describe the official position of the church but are not a criterion for membership”⁴¹. These 28 Fundamental beliefs are detailed in Appendix B: Adventist Beliefs in the rear of this book

Perhaps most interesting about the Faith however, specifically in reference to this thesis, is the confidence with which the faith uses modern technology to spread its message, and by extension, how entrenched it has become in the digital world, and how strong and clear that digital presence is. This progressive technological attitude came somewhat as a surprise compared to the position of the Roman Catholic Church on technology, as seen in an October 2010 ‘Catholic Herald’ article:

Office for evangelising cyberspace does not have internet access, says official

The head of the new pontifical council charged with evangelising cyberspace has said that his new office does not have an internet connection Archbishop Rino Fisichella, president of the Pontifical Council for Promotion of the New

⁴⁰ Accessed using the Internet Archive ‘Wayback Machine’ from the Official Seventh Day Adventist Webpage c. December 1996 <http://web.archive.org/web/20061206202842/http://www.adventist.org/world_church/facts_and_figures/history/index.html.en>

⁴¹ Quoted from 28 Fundamental Beliefs Article <http://en.wikipedia.org/wiki/28_Fundamental_Beliefs> While it is acknowledged Wikipedia is not a scholarly source, incidental evidence from further research suggests this quote to be accurate

Evangelisation, made the startling admission at a press conference unveiling the new council A Motu Proprio issued on Tuesday established the responsibilities of the council, which include “studying modern means of communications”⁴²

This lies in stark contrast to the Seventh Day Adventist faith, where much of the research included in this paper stemmed from the faith’s own Internet website, detailing almost all of the faiths many facets.⁴³

As previously discussed, the Seventh Day Adventist faith consist of a set of 28 fundamental beliefs. These beliefs closely reflect many similar ideologies to other protestant and conservative christianity and are relatively definitive in nature. Many of the beliefs are tied to a fundamentalist interpretation of the bible, including the sabbath occurring on saturday “the seventh day”, and a literal reading of the genesis creation narrative, but can extend as far as a rejection of secular, non-hymn based music⁴⁴. However, the church states these beliefs to be ‘descriptors not prescriptors, and are not a criterion for membership’ and thus not all Adventists hold strictly to all of the beliefs and official positions of the church.

Much of the research on the Seventh Day Adventist faith comes directly from the extensive Official Website of the world church, which details large portions of the churches beliefs, missions and work around the world. This digital presence not only consists of their sizable website but also includes what they call “Adventist Media”, which includes print and advanced communications technologies in broadcasting. It is split into 4 distinct areas; Print, consisting of the “Adventist Review” which has been in

⁴² Excerpt from “Office for evangelising cyberspace does not have internet access, says official” by Rupert De Lisle Catholic Herald, Thursday October 2010 <<http://www.catholicherald.co.uk/news/2010/10/14/office-for-evangelising-cyberspace-does-not-have-internet-access-says-official/>>

⁴³ Official Website of the Seventh Day Adventist Church - <<http://www.adventist.org/>>

⁴⁴ The Church’s stance on music was discovered through a posting by an ex-Seventh Day Adventist on the Social news website Reddit and its subsequent discussion “I Am An Ex Seventh-Day Adventist AMA [Ask Me Anything]” <reddit.com/d1bq3>

print for 150 years and is the church's flagship journal. Radio, which is covered by "Adventist World Radio" which aims to bring the adventist message "to people in the hardest-to-reach places on earth, in their own languages". It operates on Shortwave CB, AM and FM frequencies, as well as Satellite broadcasts (such as Sirius and XM) and reaches 2/3rds of the world in 70 languages. Television, perhaps one of the most used Adventist Media areas includes the Adventist Television Network, which uses a global satellite network of six 24/7 television stations bringing the Adventist message and Christian programming around the world.

The final area of Adventist Media is the Internet itself. Much of the 3 previous areas of Adventist Media do not only have a strong internet presence but much of their product is also made accessible over the internet. In addition, particular SDA churches across the world stream their services live over the internet, as well as make accessible a full digital library of every service ever streamed.

This push into the digital world with internet live streaming, satellite radio and what Adventists call "digital crusades" in which there is an exchange of live streaming video information between churches, makes this faith perhaps a prime candidate upon which to test yet another means of digital communication. At the very least, the use of online game technology as a means of communication for this faith is certainly justified when referenced against the churches affinity for technology.

Fig. 65: Projector installed inside the sanctuary for taking part in digital crusades and other events

Fig. 66: Altar showing the projection screen set up behind it

The congregation celebrates mass in French, and is one of two french speaking Seventh Day adventist churches in the City of Ottawa. Mass is officially celebrated at 11 am on Saturday, as per the instructions of the World Church, however visits to the church on Saturday outside of this time-frame suggest a much longer, possibly day long service of sorts, with the “official” worship service beginning at 11

Also evidenced on visits to the church on their sabbath day as well as accounts by the building’s caretakers, the congregation is so large in fact that dual masses are currently under consideration by the administration, in an attempt to accommodate all of the worshippers. This fact of the church reaching its physical capacity, coupled with the previously stated affinity for digital technology allows for a unique situation for the project of this thesis. The proposal will perhaps fulfill the needs of the church as it stands, while simultaneously allowing for the experimentation of the use of a hybrid paraxial building and a symbiosis between the two.

The Documentation Process

Before any new proposals could be made, the Building was documented. This process entailed an on site sketch of plans and elevations, to get an overall feel of the building, and a preliminary understanding of the structural systems and circulation. This was then supplemented with on site measurements, which were then drafted to form a set of standard AutoCAD plans, sections and elevations of the building as it exists. In addition, a 3D site model was built of the surrounding area, as well as a high-quality 3D model of the existing building itself, which was based on the produced CAD drawings. These drawings and models were supplemented by historical drawings, discovered in part at the National Archives of Canada, Jewish Archives, Hagit Hadiya’s 1996 Thesis and a set of current documents produced by Barry Hobin. This drawing

package was further supplemented by use of a 3D scanner. This tool slowly scans a laser across a surface and generates a point “cloud” of distances, and by combining multiple clouds using similar triangulated ‘targets’ between each scan, the scanner is able to generate a 3D point cloud model. This process is interesting due to the objectivity of the tool itself, all imperfections, debris and attachments are unforgivingly recorded by the scanner creating a ‘real’ digital representation of a physical object. However the subjectivity of 3D laser scanning appears when one chooses what to do with and how to use the information it produces. Once the documentation was completed and studied, in collaboration with on site visits and knowledge learned about the tenants of the building, the proposal for the expansion to the building commenced.

Fig. 67: Scanstation 3D Scanner on site

Fig. 68: On site sketch of existing building with measurements and notations, South Elevation

Fig. 69: Current North Elevation

Fig. 70: Current South Elevation

Fig 71 Current 2nd Floor Plan

Fig 72 Current 1st Floor Plan

Fig 73 Current Basement Plan

Fig. 74: Current Front Facade [West Elevation] w/ 3D Point Cloud

Fig. 75: Current Rear Facade [East Elevation] w/ 3D Point Cloud

Fig. 76: 3D Point Cloud of Exterior and Immediate Context

Fig. 77: 3D Point Cloud of Interior - Above 2nd Floor Looking East

Fig. 78: 3D Point Cloud of Interior - Ground Floor Looking West

Fig. 79: 3D Point Cloud of Interior - Section

Fig. 80: 3D Point Cloud of Interior - Isometric

Fig. 81. 3D Perspective Rendering - West and North Facade

Fig. 82: 3D Perspective Rendering - West and South Facade

Fig. 83: 3D Perspective Rendering - Context - Looking South on King Edward

Fig. 84: 3D Perspective Rendering - Context - Looking East on George

Fig. 85: 3D Perspective Rendering - Context - Aerial view

The documentation process was critical in not only understanding the physical attributes of the building, but to also put as much of a story behind each brick as possible. Understanding the immaterial attributes of the building are as important as the material, especially when considering its architectural importance as a possible heritage building. In addition, by using game technology to create an interactive pseudodigital representation of the building in its current state, in many ways the building is able to 'last forever'. By then transforming the pseudodigital representation into a hypodigital embodiment that can include the story of the building, and not simply the building's physicality, the building can be even further 'saved' from destruction. While this study is closer concerned with the hybrid paraxis of a physical and hypodigital expansion, and less with the heritage conservation aspects attributed to this building, it remains an important point to show the possibility and promise of hypodigital space in relation to heritage conservation. Use of the hypodigital in heritage conservation did not go unnoticed, and was discussed outside of the confines of this study as yet another application of the technology. Indeed this particular application is seen gaining traction in the wider heritage conservation community as evidenced by the work done on the Mayan archaeological site in Copan, Honduras by G. Agugiaro, F Remondino, G Girardi, J.von Schwerin, H. Richards-Rissetto and R. De Amicis.⁴⁵ These scholars are currently experimenting with game technology to reconstruct a large Mayan landscape and archaeological area for analyses and e-learning applications.

However, to keep the scope of this study from getting too large, much of the heritage conservation aspects that are addressed within the Mayan archaeological study are not explicitly addressed within this project, but were considered and included as best as possible within the architectural proposal.

⁴⁵ "Web-based Interactive Tool for Multi-Resolution 3D Models of a Maya Archaeological Site" by G Agugiaro, F Remondino, G Girardi, J von Schwerin, H Richards-Rissetto, R De Amicis

Chapter 6 The Proposal

The Dual-Building Expansion

As previously noted, the formal architectural proposal consists of two parts subverted together towards co-existence. The first half is a traditional building, executed within a conventional architectural framework using common architectural drawings and pseudodigital 3D perspective renderings. The building however is designed using methodologies borrowed from entertainment design, which begins to push it toward the hybrid paraxis. Pseudodigital representations were used to highlight their place in architectural *representation*, that is, the entertainment-designed traditional building is re-presented as a physically constructed space. The other half is a Paraxial building, designed using entertainment design and traditional architectural methodologies and constructed using game technology into a hypodigital space. Three different game-engines were considered for use in constructing the Paraxial design, and full detailing of game technology and the three considered game-engines is available in Appendix A 'Game Technology' at the rear of the book.

The Site

As part of the Carleton Immersive Media Studio's Directed Research Studio, the site selection was somewhat pre-chosen as part of a larger research initiative :

The studio will document five urban sites and consider them as possible candidates for increased density. Each of these sites has a significant heritage building that is being used or has been used as a place for religious practice.⁴⁶

Of the five sites, The particular site chosen as a test-bed for this thesis was 375 King Edward, in Ottawa's North end. As previously stated, The building previously served as one of Ottawa's first Jewish Synagogues, and is currently a French Seventh Day Adventist Church. While the site selection was somewhat pre-determined, this in no way negatively affected the project. In reality, this particular site proved to be a boon to the study, with the Seventh Day Adventist Faith being so well entrenched in Digital Media as previously discussed.

In its current incarnation, the boundaries of the site are restrictive to say the least, and do not allow for expansion in any direction excepting to the east or rear of the building. Expansion to the rear was seen to be unsatisfactory, partly due to the basketball court used by the church youth which would be lost, and to the heavy use of the space as a car park by church attendees. Upon first inspection, The small park to the immediate north of the site is made inaccessible to expansion possibilities due to a vehicular access way for the Hydro Power substation. However further investigation showed behind the substation wall is a large open area, and by moving the vehicular access route northwards from its current location, to the immediate south of the streetside substation building, could allow for the church to then expand northwards into the park.

⁴⁶ Excerpt from the Directed Research Studio 2010-11 Outline by Professor Steve Fai

Fig 86 Site Details

The Traditional Expansion

The Traditional Expansion began with working out the program for the site. While it was clear a larger sanctuary space was required for sabbath worship, other ancillary spaces were also highlighted as being in need of addition or refurbishment. These included a new production grade professional kitchen on site, with food (freezer) storage, a place for children's weekly schooling and entertainment during sabbath worshipping, and a need for more administration space, both in terms of office space for the minister and his secretary, and the church Elders, but also in terms of formal meeting rooms for church's varying administrative councils. The church also required new barrier free access, as well as integrated A/V equipment and a central A/V control room, which would alleviate much of the buildings current ad hoc wire jumble and technical difficulties.

Once the program elements were established, an expansion was designed, laid out and modeled, using a traditional architectural process. While the arrangement and detailing of this process could be explained, in essence it was found to be irrelevant. This first iteration, and subsequent iterations of this particular permutation of the building's design became nothing more than the most extreme pole from which the traditional would be subverted toward the hybrid paraxis. As a conservative starting point however, it served its purpose, allowing for the next more radical steps that would allow for the subversion to occur.

To facilitate the subversion of the traditional expansion, methodologies from entertainment design and game level construction were used to describe and programmatically break down the spaces, in an attempt to re-evaluate what should be included within the traditional expansion. By approaching the expansion and its

program in this way, traditional architectural ideologies on program organization are subverted from static ideas to dynamic actions.

A traditional understanding of 'program' is perhaps one of the bastions of architectural design. A traditional understanding simply means a 1:1 correlation between need and space, a list of spatial necessities (office space of a certain size, residential space of a certain size etc,) dictates the architecture in a way that the building becomes a puzzle to be solved and these programmatic spaces are the pieces. This arrangement however is contrary to the methods employed by paraxial entertainment designers for constructing space, as discussed in part one. By thinking of the physical building in terms used to describe hypodigital game constructions, one can begin the subversion process toward the hybrid paraxis. Thus, the program of spaces for the physical building moved from a prescriptive list to a series of descriptive levels, detailing the 'core mechanic' or primary action that would occur within each level. In addition to this type of organization, sculptural elements, corresponding to architecture in the Paraxial building, were added to the Physical building as a means of further bridging the divide between the two worlds.

Fig 87 Front Perspective -King Edward Ave Looking East

Fig 88 Context - King Edward Ave Looking South

Fig 89 Context - George St Looking East

Fig 90 Context - Southwest Aerial View

Level 1: Worshipping

In this level, the primary function of the building is revealed: worship. Thus, the level is layered out into 3 main zones, the object of which is to progress the user/player to a state of worship. The first zone, or Orientation Zone, occurs upon entrance, and serves as a zone where the user/player not only first interacts with the space but also allows for a moment of pause, where the user/player is able to process their surroundings and subsequently indicate to the user/player where to go using immersive navigational tools. The second zone, the Transition Zone, is intended as a bridge both mentally and physically, intended to simultaneously physically move the user/player from the orientation zone to the final Worshipping Zone, and move their mind from the distractions of the exterior world to a place of calm and reverence. In the final zone, the user/player enters with a mind set for worship, and this zone enables (and indicates) that worship through scale, light and interaction. The square shape of the final worshipping zone is intended to allude to the strict order of the mass celebrations witnessed on visits to the site on the church's sabbath, as well as that everyone within the sanctuary are equals as they practice their faith.

LEVEL 1: WORSHIPPING

Z O N E S

- ORIENTATION
- TRANSITION
- WORSHIPPING

Fig. 91: Level 1 Breakdown

Fig. 92: Interior Perspective Ground Floor - Orientation Zone looking South

Fig. 93 Interior Perspective Ground Floor -Worshipping Zone Looking Southeast

Fig 94: Interior Perspective Ground Floor -Worshipping Zone looking West

Level 2: Celebrating

The secondary level of the building was chosen to be celebrating, on the understanding that worshipping is primarily a singular, personal act. Thus, the secondary level is one for acts of plurality and celebration, embracing many interacting with many versus many interacting with one in the first Level. This level is simplified from level one, requiring far less transitions for mental and physical states, thus, it comprises of two zones. The first zone, an Orientation Zone, with similar purpose to the orientation Zone of level 1. Using immersive navigational tools, that is, the colourful hand railings, the user/player moves into the second zone or celebration zone, in which the crowd interaction occurs. This zone should allow for differing levels of celebration, but should always be directed toward the many interacting with the many. The circular shape of the celebration zone is intended to allude toward the idea of the many interacting with the many, as well as the idea that participants often like celebrations to continue for as long as possible, much like the never ending nature of the circle.

LEVEL 2: CELEBRATION

Z O N E S

ORIENTATION
CELEBRATING

Fig. 95: Level 2 Breakdown

Fig 96 Interior Perspective -Looking southwest into Celebration Zone

Level 3: Overseeing

The third level is intended to act as an area in which user/players would oversee or govern the functioning of the church. This level revolves around organization and supervision. In this level, the greatest amount of overlap between the Paraxial and traditional expansions occurs, as the level allows for simultaneous physical and digital interaction for the purpose of organization. This requirement derives from the idea that perhaps not all of the church's organizers and overseers are always able to physically meet when necessary, and thus, the zones of this level intersect between each expansion to allow for the meetings to occur. By extension, the zones of this level are somewhat more constant between the two expansions than zones of earlier levels. The zones of this level begin like the first two levels, with the Orientation Zone meant to orient and navigate the user/player toward the next Zone. This navigation occurs using materiality. A dark channel of wood within the stair of the Orientation zone, coupled with the same materiality on an upper railing is intended to guide user/players toward the entrance to the dark wood stairway to Overseeing level. The second zone, the Work Zone, is intended as a zone for individual reflection and activity required prior to moving into the final zone. The final zone, the Overseeing Zone, allows for the discourse to occur between user/players on the organization and supervision of the church and its activities. The rectangular shape of the Overseeing Level is intended to allude to the idea of the progression or procession of organization, as well as the rigid structure surrounding the church's many organizational and managerial committees and boards.

LEVEL 3: OVERSEEING

Z O N E S

O R I E N T A T I O N
W O R K I N G
O V E R S E E I N G

Fig. 97: Level 3 Breakdown

Fig. 98: Interior Perspective - Working Zone Looking South

Fig 99 Interior Perspective - Overseeing Zone Looking West

By building the traditional expansion with these descriptive actions as opposed to static ideas or as a programmatic puzzle, the physical space begins to become subverted toward the hypodigital. However, overlaps between the spaces are the most important subversion for the two “halves” to come together and function as a single entity. Within the physical building, these manifest as multiple architectural elements, including “windows” or digital screens which show fixed views of the Paraxial expansion and its inhabitants. It also manifests through glass adornment, which form a ‘shadow’ or reflection of elements of the Paraxial expansion within the physical building. These include the central Glass spiral in the Orientation zone, which acts as the main circulation in the Paraxial building, as well as the exterior glass additions which act as a reflection the perceived physical presence of the Paraxial building. These additions are intended to allude to the idea of the existence of the Paraxial building, that is, that there is more to the physical building than would appear at first glance.

Fig 100 Front [West] Elevation

Fig 101 Back [East] Elevation w/ Transparent Glass

Fig 102 Side [South] Elevation w/ Transparent Glass

Fig 103 Ground Floor Plan [Level 1 - Worshipping] Scale approx 1 250

*Fig. 104: Second Floor Plan [Level 1 - Worshipping Level 2 - Celebrating].
Scale approx. 1:250*

Fig 105 Third Floor [Level 3 Overseeing] Scale approx 1:250

The Paraxial Expansion

Unlike the Traditional expansion, which began with working out the program, the Paraxial expansion began with a number of visual studies on the on the form and nature of the building. This was done in accordance with Entertainment design principles, *using perspectives and drawings in an attempt to design the architecture.* Concurrently to the progression of these studies, the various spaces used in the design were added and subtracted. The reason for the indeterminate and undefined nature of the program when compared to the Traditional expansion was in some ways, a response to the nature of the ability for hypodigital space to adapt and change its program as necessary. Thus, the first iteration of the space would give a better idea as to the needs and requirements of the program once it was constructed within the *game-engine and explored and inhabited.*

Fig. 106: Visual Study of Exterior - Earlier Iteration of Digital Building

Fig. 107-110: Design Vignettes of Earlier Iterations of Digital Building

Once this was done, a clearer idea as to the program could be formulated. Firstly, and perhaps most importantly, the main digital sanctuary or 'Great Room' acts as a multifunction space, allowing for both real time digital celebrations of mass on the sabbath, as well as a large scale meeting area for user/players. This main multifunction space on the ground floor is intended to act as the anchor for the building, and remain throughout the buildings life. However, while the space is intended to be an anchor this by no means suggests it remains static. On the contrary, it is envisioned that this space be animate-able, changing its general size, shape and lighting depending on the function it will perform. These changes are limited however to administrator level user/players only, and thus, can only be triggered once the appropriate username and passwords are input into the space.

The main function however, of the Great Room will be the celebration of mass on the sabbath. These celebrations would rely on an emerging technology within the game industry that allows for real-time 3D representations of people to be generated. Thus, while the pastor delivers his sermons from the physical building, a real-time 3D representation of him is simultaneously shown on the altar of the Paraxial building. This technology can be seen with the Kinect accessory for the Xbox360 and experiments using this device by computer programmers have unlocked the potential for this type of real-time digital projection⁴⁷.

⁴⁷ Youtube user okreylos was perhaps one of the first to demonstrate real-time 3D video capture using a hacked Kinect accessory <<http://www.youtube.com/watch?v=7QrnwoO1-8A&feature=relmfu>> In addition, his subsequent experiments combining 2 Kinects, show the potential for real-time 3D behind this accessory. Of particular interest to this study are his videos "A day at the office" and "All quiet on the Martian Front", which specifically demonstrate the real-time projection of physical people into hypodigital spaces using the Kinect camera. Also, in the Video "All Quiet on the Martian Front", the interaction seen between himself and his coworker occurs while they are both in different physical parts of the building. That is, They are both transported from different physical places into a hypodigital space using real-time 3d projections of their physical bodies. It perfectly demonstrates the use of the Kinect as described within this study <http://www.youtube.com/watch?v=BOTItUNg6dc&feature=channel_video_title>

As the hypodigital space of the Paraxial building allows for heavy spatial evolution, it is expected that the ancillary spaces of the building, will change over time as the needs of the church evolve. These changes are more likely to be updates to the space rather than the built-in animations seen in the Great Room. These ancillary spaces, in this proposal, house three programmatic functions.

The first is meeting rooms. These meeting rooms connect to the "Overseeing" level of the Traditional expansion, and allow for interaction between the hypodigital and the physical. This interaction then allows for a greater level of participation not only for local council members, who may be physically unavailable and are then facilitated through the Paraxial expansion, but also for international council members, allowing for elders of other churches all over the world to participate and interact with elders and organizers of this church. This then benefits the organization of multi-church or multi-national events, such as crusades or large celebrations, by supplementing the problems of physical barriers with the strength of hypodigital interaction. Similar to the Great Room, use of the Kinect camera would allow for those in the physical building to be projected into the Paraxial building, while screens in the physical building allow for those in the Paraxial building to be seen and heard. However, the interactions between the meeting rooms of both buildings could also be limited to an all Hypodigital inhabitation. That is, instead of digital projections of the physical inhabitants using the Kinect camera, They themselves could log into the Paraxial building and interact with those unable to be physically present.

The second programmatic function of the ancillary spaces are the active archives. What this means, is that any user/player is able to enter the archive space in the Paraxial building and retrospectively participate in the mass of this church or mass and sermons from other churches while feeling a connection to being in a place worship. This allows for the user/players who miss sabbath service to still be able to “come to church” and interact with others, while celebrating mass at their leisure. As previously stated, it also allows for user/players who did participate either hypodigitally or physically in their own church’s mass to watch or listen to sermons from other Seventh Day Adventist churches around the world.

The active archive is made ‘active’ for two reasons. The first, again, is the ability of the Paraxial building to be updated. This allows for the archive to expand and contract as needed with each update to the space. The second is the content itself. By using a hypodigital space to essentially ‘curate’ past sermons and other content, the displayed content also has the ability to drastically change. Thus, the archive content can be quickly updated, revised or reorganized based on a variety of things such as age, themes or subject matter.

The third programmatic function is Reflection. By taking advantage of the possibility afforded by hypodigital space, interesting areas of reflection can occur within the building that would otherwise be physically impossible. This allows for user/players to enter the Paraxial building, be a part of the community and interact with each other, but also have a blessed hypodigital space for quiet reflection, personal bible study, and prayer. This hypodigital ‘chapels’ offer a literal 24/7 ‘always open’ access to the user/player’s place of worship, as well as act as a place for personal pause in perhaps a greater social event or gathering.

Within the proposal, this reflective space takes the form of a garden. As the building evolves however, the current garden may be replaced or supplemented with other spaces that suit the needs or demands of the inhabitants. By using the affordances of the hypodigital, such as the control of audio, the experience of reflection within the space can be enhanced. Music, prayers, or simple ambient sounds all existing within different areas of the same space allow user/players to find that which suits them best for reflection, while still being connected to a holy space and other inhabitants.

Fig. 111: Visual Study of Exterior - Current Iteration of Digital Building

Fig. 112: Visual Study of Great Room - Current Iteration of Digital Building

The Presentation

While the Traditional expansion is presented using traditional architectural convention of plan, section and elevation, supplemented with 3D visualization perspectives and requires little to no explanation or clarification, the Paraxial expansion however, does. The Presentation of the Paraxial expansion aims to address two slightly varying purposes. One, is the effectiveness of the design itself, as per the proposal's intentions, and the other is to act as a catalyst for the discussion of the use of game-technology and hypodigital space in the architectural profession. Therefore, the Paraxial building is not presented with drawings of architectural convention, instead the space is included in full on the attached optical disc, for the reader to inhabit themselves. The intention is to understand the space through the immersion in the space as opposed to a conventional understanding⁴⁸. In addition, while much of this study was done with the idea with the user/player being the everyday individual with average computing capability, and is partly presented as such, the other portion aimed at generating discussion on the use of the technology itself is presented differently. It is presented as a full 180 degree navigable 3D environment, allowing for a much greater level of immersion than could occur for the everyday individual. The 180 degree Immersion Hexagon then allows for alternative questions to arise when considering hypodigital space, such as when inside the Hexagon, where are you truly? As you are immersed within a hypodigital space, without the confines of a "window" are you then, truly *inside* the hypodigital? Or perhaps, you are only within a white hexagon, sitting in a large room. The immersive experience however aims to question these notions of place, allowing for a wider understanding of the possibility offered by hypodigital space within the architectural profession.

⁴⁸ This refers to understanding of the building through the eyes of the practice of architecture, that is, the understanding of a building through Plans, Sections and Elevations

The other aspect of the Paraxial presentation that requires some explanation is the self-reflective image of oneself in the hypodigital. While this notion was not touched on in earlier chapters, it remains an important part of the hypodigital. The ability for one to be perceived by others in the hypodigital, forms the backbone for the needed social interaction to bring the spaces to life. In this presentation, these self-reflective images or 'avatars' as they are called within the entertainment industry, are ordinary "default" avatars. These are not intended to be the final versions available to user/players. However the implementation of customized avatars falls outside of the purview of this study, and thus is not included as part of the presentation.

To speculate however, while customized avatars are currently achievable using the same current game-engines considered in this study, work on even more immersive methods of Human and Computer Interaction are currently being experimented on within the industry. The experiments most important to this study however, revolve around the Microsoft Kinect accessory for the Xbox 360 console as previously stated, and involve tests of real time facial mapping and real time 3D immersion of a physical person in a digital environment⁴⁹. This would allow user/players to map their own faces onto digital bodies, or even disregard digital bodies entirely for digital projections of their actual physical bodies. Thus, using knowledge learned from these experiments with the Kinect, the self-reflective image of a user/players in a hypodigital space, could very well be themselves, and not a proxy of themselves, as is currently the case.

⁴⁹ See footnote 47 on page 114.

Chapter 7 Conclusion

The 1982 release of AutoCAD by Autodesk can in hindsight, be said to be a pivotal moment in the modern history of architecture. Today however, usage of computers and its correlation wholly to AutoCAD and modes of scientific representation, is an unfortunate reality within the profession. Perhaps, it is not the fault of architects. The prevalent software which has been adapted and adopted by the architecture industry can find its roots as engineering design tools and not architectural design tools, which is possibly to blame for the 'scientific representation only' stigma generally attached to the computer within the industry. By looking at other fields, such as the entertainment industry, to see how spaces are designed and executed, a greater understanding of the role of the computer in space creation can be attained. For example, In entertainment design, hand drawings are done directly into computers, allowing for a mix of drawing mediums that would otherwise be impossible.

However it should be clear that this study does not intend to demonize scientific representation in architecture, only to suggest that it is not the only outcome of the inclusion of computers to architecture. As shown within the project itself, scientific and pseudodigital representation has its place within architectural convention, and indeed can be seen as a necessity in the effort to convey architectural designs and ideas. But it is not the only way, as learned from the Paraxial architecture of entertainment designers, and the hypodigital spaces of video-games.

In addition, while this study aims at showing a balance between the physical and the digital is a preferable condition, the potential of hypodigital spaces on their own, extend far beyond those explored within this study. To understand this potential,

one need not look further than the gaming industry itself, which is rife with explorations and indications as to the future of such technology. Then, only your imagination is needed to translate some of these ideas into architectural practice.

The first, and perhaps most radical of these ideas is the idea that hypodigital space need not conform to traditional geometric presentations of architecture. Games such as 'Portal' only begin to undermine the relationship between the user and those traditional architectural experiences, through the navigation of such spaces. However, the architecture of 'Portal' itself remains for the most part, a normative architectural presentation. An example then, of a non-normative geometric presentation of hypodigital space is the time-trial levels of 'Mirrors Edge', developed by EA Digital Illusions CE, and released in November 2008. In these levels, the architecture is highly abstracted and consists of a seemingly random arrangement of geometry through which the player must navigate. These levels hint at the idea of how far abstracted from the normative hypodigital space can be. These abstracted spaces could then allow for entirely new forms of architectural experience that would be unique to hypodigital spaces.

Another interesting potential for the future of hypodigital space within the architectural realm is the idea of user-generated content. This trend in video-games, while not new, reached a new level of awareness with the success of the Media Molecule developed title LittleBigPlanet, released October 2008. Users were granted the ability to create new levels, enemies and puzzles themselves, using the integrated editor tools included within the game. This idea is an interesting one for hypodigital space. By creating simple tools that could allow users to customize and create their own spaces, a new kind of vernacular architecture emerges. From this, the architect could then curate these user-generated spaces into a hypodigital building, or even use the information to inform the design of a physical building. In this way, an interesting type of hypodigital and/or physical building emerges, one formed of a hybrid of vernacular user-generated space and of architect-designed space.

Fig. 113: Mirror's Edge Pure Time Trial Level 'Flow'

Fig. 114-115: LittleBigPlanet (Above) Empty Level under construction. (Below) Completed Level.

While the spatial-temporal promises of digital space are vast, it is easy to see that the execution of such spaces within architectural practice is lacking, a point conveyed by the opponents of the use of computers in architecture:

computer graphic applications in architectural design, with their seductive manipulations of viewpoints and delusions of three-dimensionality, are still little more than an efficient “mechanism of composition” While they make the objectification of “another” reality appear more intense, their use has not improved the quality of our environment computers have contributed next to nothing toward deconstructing the hegemony of panoptic space and proposing a more meaningful and participatory urban space ⁵⁰

While this criticism is pointed to undermine the use of computers in architecture, it paradoxically reinforces the idea of looking outside Architecture to the Paraxial for inspiration on changing the status quo within the industry The Paraxial, and by extension the use of the hypodigital, perhaps addresses the previously expressed shortcoming and can if not improve (on an immediate level), at least supplement the quality of our built environment. By looking outside of the field of traditional architecture for a more meaningful view on the execution of digital space, we open ourselves to the possibility of engaging the different aspects of architecture in an alternative way

⁵⁰ Excerpt from ‘Architectural Representation and the Perspective Hinge’ by Alberto Perez Gomez and Louise Pelletier Pg 377

PART III

THE APPENDICES

Appendix A Game Technology

The current generation of video games are the product of years of technical evolution and software development. The progress of this technology has reached the point at which it now allows for the appropriation of much of the technology for use in alternate contexts, an interesting technological reversal considering much of the technology employed today in video games was similarly appropriated from other fields of computer graphics.

This current game technology is a critical component in the execution of digital space and in many ways is the most important component. It is the component which brings the digital space to “life”, and allows for a user to inhabit and interact with the space and other users. Today most of the gaming industry is dominated by ‘Consoles’. A console is a specialized or modified computer, mass produced for consumers with the sole purpose of playing games. The term was developed to differentiate the machine from the personal computer and arcade machines. While the profits and demand in the industry is dominated by these consoles, the making of games however, still occurs on personal computers. This allows for some of the underlying technology used to create these games to be accessible to fields outside of the gaming industry. This underlying technology, called a ‘game-engine’ is discussed later within this appendix.

A Brief History

In 1983, the video game Industry was in crisis, imploding due to an overly saturated market with dozens of video game consoles and hundreds of low quality games. It was reborn in 1985 however, with the introduction and commercial success of the Nintendo Entertainment System (or Nintendo Famicom/Family Computer in Japan) which introduced most gamers to the character of Mario and his world.

What separated “Super Mario Bros.” for the NES from all of its competition at the time was the world in which the game’s story unfolds and the player inhabits. Henry Jenkins, a professor in Provost and ex director of MIT’s Comparative media studies program, situates Super Mario Bros. within the context of the evolution of games of the time:

what gamers found astonishing when they first played [Super Mario Bros.] were their complex and imaginative graphic realms, which were so much more sophisticated than the simple grids that Pong or Pac-Man had offered us a decade earlier ⁵¹

It would be Mario and Nintendo’s other successful franchises (Such as Donkey Kong and Zelda) that would stabilize the industry, allowing for its evolution over the next 28 years to its current healthy state. There are a great many avenues in video game history that can be seen with ‘architectural’ significance. One of the most significant would be the move over from 2D sprite-based systems to fully realised 3D polygon-

⁵¹ Excerpt from “Game Design as a Narrative Architecture” Henry Jenkins, MIT <<http://web.mit.edu/cms/People/henry3/games&narrative.html>>

based games in the mid 1990s, with the release of the Sega Saturn, Sony Playstation and Nintendo 64 game consoles, which were capable of producing 3D graphics.

With respect to this study, however and particularly this chapter on gaming technology, the most important point video game history with respect to architecture was the “invention” and popularization of the first-person shooter genre, which allowed gamers to interact with a constructed game world in real-time from a human scaled perspective. One of the first documented first-person shooter (FPS) games was ‘Maze War’, a 1974 game developed by Steve Colley on the Imlac PDS-1 at the NASA Ames Research Centre, in which players were capable of moving backward and forward, and around corners in a Maze. Players were able to play together on a local computer network, and when a player saw another player in the maze, they were represented by an eyeball and were able to shoot them to gain points.

However its “invention” as it pertains to the modern era can be unmistakably traced to the release of Id software’s ‘Wolfenstein 3D’ in 1992. While its commercial success opened the door for the genre’s eventual mainstream adoption, it was not without its limitations. Its main limitations to its spatial realism were that textures could only be applied to the walls, and not the floor and ceiling, as well as the walls had to conform a 90 degree grid based arrangement. The spaces were also limited to a constant height throughout the entire game, as well as uniformly lit. All of these issues were rectified a year later (1993) with Id Software’s release of ‘Doom’, which was a vast technological advancement over Wolfenstein 3D, as all surfaces could be fully textured, and the spatial geometry was not limited to a single height or grid. More importantly however, the use of lighting and directional sound became a major part of the game-world’s atmosphere, which heightened the players immersivity into the fictional space. The (re)introduction of networked multiplayer in ‘Doom’, which was

Fig. 116: Maze War on an Imlac PDS-1

Fig. 117: Screenshot of 'Wolfenstein 3D'

Fig. 118: Screenshot of 'Doom'

not included in 'Wolfenstein 3D', allowed for multiple people to freely inhabit and experience the same virtual environment simultaneously. This inclusion, in addition to the games' immense popularity and aforementioned technical and experiential achievements, cemented it as one of the most important releases in game history, and it became the benchmark against which all other first-person shooters of the generation (and arguably, future generations) were compared.

The first-person shooter genre is also often pegged with the responsibility for the proliferation of players demand for greater realism in game graphics, and no doubt graphical quality remains to be one of the genre's defining characteristics. However, the most important contribution the genre made to the industry, that would change the way games were made was the introduction and subsequent evolution of the game-engine.

In early arcade-era game development, each game was programmed as a singular entity, that is, the entirety of the game was written in code from scratch. This was necessary as arcade technology and hardware often changed, quickly driving older code to obsolescence due to newer hardware allowing for greater resources. While the stabilization of the industry with the Nintendo Entertainment System and by extension an almost standardization of gaming hardware should have offered firm ground on which to set up reusable coding, the singular entity game development style continued.

It would not be until the mid-1990s, with the immense popularity of Id Software's Doom, where the idea of the game-engine would see its roots. Other developers took notice of the technological advancements in the game, and rather than work from scratch on a competing product, chose to license portions of Id Software's Doom programming code, altering it and adapting it to create a new product. This development shortcut was also used by Id Software itself, reusing much of Doom's code on its sequel, Doom II: Hell on Earth, released a year later in 1994. Other games appeared using modified Doom code in 1994, including the popular Heretic, developed

by Raven Software, who improved on the user interface by adding the ability to look up and down.

By licensing and re-using code, developers were able to focus more on creating levels, weapons and characters; that is, making “content”, rather than spend time programming the underlying foundation of the game which would make it run, such as collision detection, and the ‘drawing’ of walls, floors and ceilings. This underlying code would subsequently be called the ‘engine’ of the game, and the separation of the engine from the content would allow for development to be streamlined into specialized teams.

Games made in the late 90s were made with this split in mind, with development of the engine and content occurring separately. Perhaps the most significant of these releases was Epic Games’ 1998 release of Unreal, with which it bundled the Level editor application UnrealEd, which in reality was a graphical user interface for creating content using the Unreal Engine. This step made content creation akin to many other artistic fields, such as 3D animation. This also allowed licensees of the Unreal Engine to not only gain access to the underlying programming code to alter as they saw fit, but a fast and easy method for creating unique content and assets, should they choose not to drastically alter the engine.

By the early to mid 2000s, the term ‘game-engine’ became the ubiquitous term used to describe any game’s underlying code, regardless of whether or not the engine was licensed for use on other games. However, developers building proprietary engines for their games still chose to build the engine apart from the game itself, allowing for the company to reuse the engine for future titles.

Current Engines

The complexity of current game engines has increased dramatically since its introduction in the mid 90s. There are many different genres and developers using a wide variety of engines that could be seen as architecturally significant, such as Rockstar Games' proprietary RAGE Engine used to create the most realistic interpretation of a digital urban fabric in its release 'Grand Theft Auto 4'. However with respect to this study and its needs for bringing the prescribed digital space to life and specifically inhabiting at a human scale, First Person Shooter game-engines seem to be a more natural fit. That is not to say however that FPS Engines have not evolved to the point of creating games outside of their genre, in fact, the contrary is actually true, with some of the most popular now general engines finding their original roots in the first person shooter genre. For the purposes of this study, 3 such game-engines were researched and reviewed as options for use in building the hypodigital space of the Paraxial building. They were chosen due to the popularity and accessibility of each engine.

CryENGINE 3 by Crytek

Fig. 119: CryEngine 3 Logo

Crytek's CryENGINE is not the most commercially successful engine, with not very many titles being made using it, other than Crytek's own games. That being said, it is without question one of the most technologically advanced game engines available for licensure.

The first generation CryENGINE was developed in 2001-2004 in tandem with Crytek's now classic First person shooter title 'Far Cry'. While the game itself received positive reviews, most of the acclaim the game garnered centered around the CryENGINE and its technical and graphical achievements. One of the greatest of these achievements was that the engine allowed the game to feature long draw distances, which is the distance from the camera where 3D information, such as polygons, would no longer be displayed. Thus, long draw distances allow for the player to "see" further, but generally requires more computing power due to the increased number of polygons 'drawn' on the screen. Far Cry (and by extension the CryENGINE powering it) allowed for draw distances up to 2 km (virtually), which was unprecedented at the time without taking a severe hit in the games fluidity or frame rate.

Another accomplishment of the engine was a glaring omission compared to other engines of the time: loading screens and loading time. On top of being able to achieve these uncommonly long draw distances, the engine was able to do so with no loading times between areas. Players were able to access all of the terrain of a level, as well as transition from interior to exterior spaces with no pauses for loading.

Fig. 120-121 Screenshots of 'Far Cry', running on the original Cry Engine

The second generation of the engine was built by Crytek slightly differently than the first, instead of building it in conjunction with a game, they first built the engine and all its content creation tools, and then used those tools to make a game, the benchmark first-person shooter 'Crysis', released in 2007. This was done in an effort to prove licensees of the engine would be able to make high-quality games with no need for altering the engine's code itself. Much like Far Cry however, Crysis' acclaim lay not in its storyline or gameplay, but in the exceptional advancements Crytek was able to make to the CryENGINE and apply in the game. Many players and reviewers however, argued Crytek had pushed the CryENGINE too far, due to the fact that upon release, computer hardware available at the time was not able to run the game to its maximum graphic potential. This was due to Crytek's inclusion of a host of advanced features that graphics cards and processors of the day were unable to execute.

It came, it saw, it conquered - our PCs that is. It's rare that we've seen a game that was so demanding on its release. The question 'Yeah, but can it play Crysis?' is now a comical catchphrase addition to most graphics card reviews

Most of us had the same traumatic experience. We installed Crysis, adjusted the graphics settings to something that resembled reasonable expectations, and saw our PCs grind to a halt. It was pretty depressing to see the GeForce 8800GT⁵² fall flat on its face when it played all other games so easily. Even the mighty 8800GTX⁵³ couldn't handle the game at max settings and even struggled at 1,280 x 1,024 . .

⁵² A common Mid to High-end Graphics card built by nVidia for PCs that was available around the time of Crysis' release

⁵³ The 8800 GTX was nVidia's top of the line graphics card at the time of Crysis' release

But, no matter where I looked, graphics card reviews and forum threads all showed the same story. Crysis was an untameable beast with current hardware and even several 8800GTXs in SLI ⁵⁴ struggled in the early days of the technology with minimum frame rates regularly dipping to unsavoury figures ⁵⁵

The ability to run Crysis (and by extension the CryENGINE 2) to its full potential is still used by testers and reviewers of graphics cards as a benchmark for the competency of the hardware they are testing. Interestingly however, of the few licencees of the CryENGINE 2, the first company to license the engine was IMAGTP (now Enodo), a French architectural and urban design communication/visualization company. Not only that, the company has already used the technology of to aid Foster + Partners win approval for the billion dollar renovation to the New York Public Library's Historic Fifth Avenue Building.

At the final presentation in New York our Interactive Virtual Model® was chosen to support the crucial questions-and-answers session. Mr Jean-Baptiste Reynes, [Enodo]'s CEO, who conducted the real-time presentation of the project remembers a member of the committee saying: 'Now, I understand how it will work' ⁵⁶

⁵⁴ SLI means "Scalable Link Interface". It is a brand-name proprietary technology developed by nVidia for linking multiple nVidia graphics cards together for increased graphic performance.

⁵⁵ Excerpts from "Crysis - Did you Upgrade?" by Antony Leather on his blog for Bit-Tech. Posted December 15th 2009. <<http://www.bit-tech.net/blog/2009/12/15/crysis-did-you-upgrade/>>

⁵⁶ Excerpt from Press release from [Enodo]'s website, dated November 21st 2008. <http://www.enodo.fr/content/Actualite-du-21-novembre-2008/actualite_du_21_novembre_2008UK.php>

Fig. 122-123: Screenshots of 'Crysis', running on the CryEngine 2

The third generation of the engine is currently under production by Crytek, but still available to license through the company, suggesting the engine itself is complete. It bills the CryENGINE 3 as a “all-in-one” solution to game creation, citing the ability of the engine to produce both high-definition console (Xbox 360 and Playstation 3) and PC games. Earlier versions of the engine were limited to only the development of PC games, thus the inclusion of consoles is seen as a major stepping stone to the adoption of the engine to other game developers. The CryENGINE 3 continues Crytek’s tradition of advancement in real-time graphic rendering technology, detailing the inclusion of advanced features such as Real-time screen space ambient occlusion, dynamic global illumination, subsurface scattering, High Dynamic Range lighting, volumetric soft particle systems, Depth of Field, Automatic Time of Day, advanced physics, destructible environments, and a draw distance exceeding 25 km.

However, while producing the best graphics of a commercially available game-engine, and arguably being the best suited for architectural and urban visualization, the difficulty of the CryENGINE 3 licensing process bars its use in this study. In addition, the difficulty of implementing the advanced features of the CryENGINE 3, as well as the distribution of its final product, would also bar the engine’s adoption in the greater architectural field. However, due to intense competition particularly from Epic Games’ Unreal Engine, Crytek announced its willingness to change its licensing structure to mirror that of its main competition. That is, beginning August 2011⁵⁷, Crytek plans to release a free-to-use CryEngine 3 Software Development Kit, which would remove its greatest obstacle for adoption: availability.

⁵⁷ Information from an Open Letter to the Crysis Mod Community from Crytek CEO Cervat Yerli, dated April 21st 2011. Read from the Re-posted letter on the InCrysis Forums due to the original page being unavailable <<http://www.incrysis.com/forums/viewtopic.php?pid=515643>>

Fig. 124-126: Jungle and Urban scenes rendered with CryEngine 3

Unreal Development Kit (Unreal Engine 3.5) by Epic Games

Fig. 127: UDK Logo

Without question, the most popular engine used today by developers to build high-quality games is the Unreal Engine by Epic Games. Titles made using the engine

with or without proprietary modifications numbered in several hundreds, before Epic Games' monumental restructuring of the licensing process for the Unreal Engine. Today, that number could easily be in the several thousands, as Epic Games repackaged the engine into a free to use suite of applications called the "Unreal Development Kit", which includes a full and up-to-date version of the Unreal Engine (currently at version 3.5) and its content creator, UnrealEd.

As previously stated, Epic Game's 1998 release of its first game, the first person shooter 'Unreal', can be said in hindsight to be watershed moment in first-person shooter history. Prior to the release of Unreal, Id software's FPS engines dominated the commercial FPS engine market, first with its Id Tech 1 or Doom Engine, and subsequently with its Quake Engine. In late 1997, Id Software was expected to continue this dominance with the release of its second generation and updated Quake Engine, now dubbed Id Tech 2, however Epic Games' release of Unreal some 6 months later would break that hold. This was due to the technical superiority of the Unreal Engine to Id Tech 2, and while a greater graphic quality was one of the main factors, its superiority was seen on a deeper level on a number of different fronts. The first and most technical, was due to the UnrealEngine being built on a higher level programming language, which allowed for greater control and flexibility for licensees wishing to modify the engine's internals. The second was the inclusion of a full scripting language; UnrealScript, which allowed for simpler but no less potent modifications to the engine.

The inclusion of UnrealScript, in conjunction with the Level-Editor UnrealEd, were seen as being the main factors for dramatic rise in popularity of Unreal, especially amongst the fans of the game, who were now able to create their own content for it, such as levels and weapons, and spawned a huge online community for creating and sharing these new assets. The ease of creating content and the power to easily modify the engine became a hallmark of the Unreal Engine, and developers took notice.

The popularity of the Unreal Engine ballooned with the release of the second generation of the Unreal Engine in 2002. Interestingly, it would not be Epic Games who would release the debut game for the updated engine, instead it would be 'America's Army' a game developed by the United States Army, and funded by the U.S. Government, which demonstrated the reach high-end game engines were beginning to enjoy. The game was first released as a global public relations initiative to help with recruitment, but has since evolved to include specialized versions for US Army training, simulations and weapons systems prototyping.

What began as an online effort to attract potential recruits has taken on a new life in the Army as an enterprise tool "America's Army," a free online game that shows players what it's like to be a soldier, was launched July 4, 2002. But beyond its recruiting role — still a major goal — the game has been adapted for training, weapons systems prototyping and even helping combat veterans readjust to life outside a war zone ⁵⁸

It would not be long however before Epic would release their own major title using the updated engine, and 'Unreal Tournament 2003' showcased the improvements to the engine in their full potential. While all of the older systems such as graphic rendering, physics and collision detection were all sizably updated, the inclusion of development tools for the home consoles of the time, the Playstation 2, Nintendo Gamecube and

⁵⁸ Excerpt from 'Much More than a Game' by Bridget Mintz Testa May 26th 2008 Defense Systems - Knowledge Technologies and Net-Enabled Warfare <<http://defensesystems.com/articles/2008/05/much-more-than-a-game.aspx>>

Microsoft Xbox were some of the most major additions made to the engine. Other notable additions were Vehicle physics and particle systems, as well as the inclusion of the third generation of the Engine's content creator UnrealEd. UnrealEd 3 was fully integrated into the Unreal Engine 2, allowing for content creators to actually test their games or content within the editor itself, showing exactly what the final build would look and play like.

The third generation of the Unreal Engine debuted in 2006 with the release of the Xbox360 title 'Gears of War' developed in-house by Epic Games. It marked an interesting departure for debut Unreal Engine titles, the most notable being its third-person viewing orientation. That is, instead of the player looking 'out' into the video game world, seeing through the eyes of their character, they instead look 'at' their character from behind. Like other engine debut titles from Epic, Gears of War showed off the what the new Unreal Engine was capable of, choosing to demonstrate the breath of the engine by using this third person approach. New features were added to the Engine some 2 years later for the sequel Gears of War 2, and was re-dubbed the Unreal Engine 3.5.

However perhaps the most significant step in the history of the Unreal Engine was the November 2009 release of the Unreal Development Kit, a free to use, but up to date version of the Unreal Engine, available for any and everyone wishing to try their hand at game development, and making top tier game technology available to the masses. This marked a significant departure, as commercial engines of the time made most of their money from the hefty licensing fees attached to their usage. With the release of the UDK, profit would instead derive from a royalty structure, where UDK licensees would pay a percentage of their sales revenue directly to Epic Games. This structure favored student and independent developers, as it lowered the cost of entry to the market, and tied development costs to commercial success. Full Unreal Engine licenses are still available however, for larger game development companies who can

afford the one-off cost, which secures not having to pay Epic Games any royalties, as well as an increased level of technical support directly from the company. In addition, UDK now supports development for the Apple iOS (iPhone, iPad and iPod Touch OS) and Google's Android platforms. The graphical capability of the mobile version of the Unreal Engine is not the same as the full PC or Console versions. However the ability for widely utilized mobile devices to power such visualizations is an interesting and important step for the dissemination of the technology.

Fig. 128: The evolution of the Character 'Malcom' from the 'Unreal Tournament' Series, showing progress in quality of each iteration of the Unreal Engine

Fig. 129-130: Screenshots of the 'Epic Citadel' tech demo of the Unreal Engine on the iOS platform

Fig. 131-132: Factory and Jungle Ruins scenes rendered using UDK (Unreal Engine 3.5)

Unity (Engine) 3 by Unity Technologies

Fig 133 Unity 3D Logo

Unity, the game engine developed by Unity Technologies, differs from the previous 2 studied engine in many ways. Perhaps the most major, is that the developer, Unity Technologies, is not in the business of making games. Unlike Crytek and Epic Games, Unity Technologies' focus is solely on

the development of their engine and its tools. This fundamental difference in approach forms the basis for the many differences between Unity and the UDK and CryENGINE. Unity was originally released in mid 2005, as a game development tool for the Apple Mac OSX operating system, seeking to fill a niche void that had existed on the platform, as most computer games up to that time were released exclusively for Microsoft's Windows operating system. However, Unity would quickly become multi-platform, adding support for Windows within the first six months of its release. In these early stages, licensing Unity functioned much like any other commercial engine, with the major difference being price.

Unity was divided into two tiers, each with differing features, in an effort to lower the bar to enter the game development market. The Unity Professional license, which included all of Unity's features, was originally priced at 1500 dollars, with a cheaper Indie license at 200. While the Indie license didn't allow for any of Unity's more advanced features, it was still seen as a relative steal considering other commercial game engines at the time were priced prohibitively high. That said, Unity was not (and still is not) the technical equivalent of the CryENGINE or Unreal Engine, as it launched well into its main competitors 3rd major iteration, and thus while technically inferior was still seen as a solid 'budget' solution for those wishing to develop simple games.

Its position in many ways, would pay off a year later with the release of the Nintendo Wii in late 2006 and its unprecedented success. What the Wii was able to do for the industry was grab the attention of the 'casual' gamer, who had been lost as the more traditional 'hardcore' games had dramatically increased in complexity and difficulty over the years, turning casual gamers away from consoles and their seemingly complicated controllers and games. Casual games on the other hand, required no special skill or long-term time commitments to play, and began to blossom on the Wii. The start of boom in casual gaming also began a demand for simpler and cheaper ways to make these types of games, lining up perfectly with Unity's budget conscious solution, which was not lost on Unity Technologies, as they added Wii development capability and support to Unity not 4 months after the console's release.

Unity would continue to be developed and improved, releasing the second generation of the engine in mid 2007. By this time, Unity had solidified its position as a powerful budget friendly solution with a large distribution capability, supporting the Wii, PC and Mac, but also an integrated web player, which allowed for Unity games to be embedded within a regular webpage. This capability still remains unique to Unity and is one of the best features of the engine, allowing for easy widespread distribution of Unity-based games and applications.

While it would be the Wii that would start the demand for casual games, it would be the release of Apple's iPhone in 2007 that would explode the casual gaming market to the unprecedented growth it has today, with Unity Technologies quickly announcing support in Unity for the development of games for the iPhoneOS (now called iOS), used in the iPhone, iPod Touch and iPad products by Apple. The success of the iOS platform increased demand for an even cheaper game development solution, as free ad-supported or low cost (99 cent) titles began to dominate the casual gaming market.

To keep its lead as a high -powered, low-budget solution, Unity Technologies made a radical change to its license. In late 2009, the company would drop the Unity Indie license entirely, instead replacing it with a free-to-use, royalty free license simply called the Unity license. This move garnered a great deal of attention for the engine, drawing scores of new hobbyist and small independent developers to Unity. The move in many ways started a shockwave throughout the industry, as Unreal responded the next month with the release of the UDK, their free-to-use version of the Unreal Engine 3, in an effort to leverage their brand and capture a dominant position in the newly emerging casual gaming market.

Unity Technologies' 3rd generation of Unity was released in March 2010 and added support for the Sony Playstation 3 and Xbox 360, and would later add support for Android Mobile OS, giving the engine the widest possible distribution capability of any engine. The technology itself has also matured, and while still not the technical equivalent to the CryENGINE or Unreal Engine, is still capable of producing relatively advanced visuals, physics and artificial intelligence.

What the engine loses in pure technical prowess, it makes up for in ease of use. Of the three engines, Unity editor and content creation system is perhaps the easiest and most streamlined. While creating content for all 3 engines is relatively easy, Unity's vast breath of importable formats, including proprietary ones from popular 3D packages outpaces its competition. In addition, much of the feel of popular 3D packages has also been replicated, including the popular Maya 3-button mouse navigation system, and drag and drop texturing and lighting. This gives Unity perhaps the shallowest learning curve of the 3 studied engines, and thus the most potential for adoption in a wider architectural context. Even scripting in Unity is based on popular scripting languages, such as javascript, instead of the proprietary scripting languages seen in both the CryEngine 3 and UDK. While the graphical capability is less than its competition as previously stated, its ease of use and ease of availability made it the primary choice of the 3 engines for use within this study.

Fig 134-137. Scenes rendered using Unity 3D (version 3.4)

Appendix B Adventist Beliefs

This Appendix shows the 28 Fundamental Beliefs of the Seventh Day Adventist Faith. It was taken in its entirety from the Seventh Day Adventist website, and is shown without any modification or editing. This was done so as not to misrepresent their beliefs by re-interpretation. The transcription is as follows:

Seventh-day Adventists accept the Bible as their only creed and hold certain fundamental beliefs to be the teaching of the Holy Scriptures. These beliefs, as set forth here, constitute the church's understanding and expression of the teaching of Scripture. Revision of these statements may be expected at a General Conference session when the church is led by the Holy Spirit to a fuller understanding of Bible truth or finds better language in which to express the teachings of God's Holy Word.

1. Holy Scriptures:

The Holy Scriptures, Old and New Testaments, are the written Word of God, given by divine inspiration through holy men of God who spoke and wrote as they were moved by the Holy Spirit. In this Word, God has committed to man the knowledge necessary for salvation. The Holy Scriptures are the infallible revelation of His will. They are the standard of character, the test of experience, the authoritative revealer of doctrines, and the trustworthy record of God's acts in history. (2 Peter 1:20, 21; 2 Tim. 3:16, 17; Ps. 119:105; Prov. 30:5, 6; Isa. 8:20; John 17:17; 1 Thess. 2:13; Heb. 4:12.)

2. Trinity:

There is one God: Father, Son, and Holy Spirit, a unity of three co-eternal Persons. God is immortal, all-powerful, all-knowing, above all, and ever present. He is infinite and beyond human comprehension, yet known through His self-revelation. He is forever worthy of worship, adoration, and service by the whole creation. (Deut. 6:4; Matt. 28:19; 2 Cor. 13:14; Eph. 4:4-6; 1 Peter 1:2; 1 Tim. 1:17; Rev. 14:7.)

3. Father:

God the eternal Father is the Creator, Source, Sustainer, and Sovereign of all creation. He is just and holy, merciful and gracious, slow to anger, and abounding in steadfast love and faithfulness. The qualities and powers exhibited in the Son and the Holy Spirit are also revelations of the Father. (Gen. 1:1; Rev. 4:11; 1 Cor. 15:28; John 3:16; 1 John 4:8; 1 Tim. 1:17; Ex. 34:6, 7; John 14:9.)

4. Son:

God the eternal Son became incarnate in Jesus Christ. Through Him all things were created, the character of God is revealed, the salvation of humanity is accomplished, and the world is judged. Forever truly God, He became also truly man, Jesus the Christ. He was conceived of the Holy Spirit and born of the virgin Mary. He lived and experienced temptation as a human being, but perfectly exemplified the righteousness and love of God. By His miracles He manifested God's power and was attested as God's promised Messiah. He suffered and died voluntarily on the cross for our sins and in our place, was raised from the dead, and ascended to minister in the heavenly sanctuary in our behalf. He will come again in glory for the final deliverance of His people and the restoration of all things. (John 1:1-3, 14; Col. 1:15-19; John 10:30; 14:9; Rom. 6:23; 2 Cor. 5:17-19; John 5:22; Luke 1:35; Phil. 2:5-11; Heb. 2:9-18; 1 Cor. 15:3, 4; Heb. 8:1, 2; John 14:1-3.)

5. Holy Spirit:

God the eternal Spirit was active with the Father and the Son in Creation, incarnation, and redemption. He inspired the writers of Scripture. He filled Christ's life with power. He draws and convicts human beings; and those who respond He renews and transforms into the image of God. Sent by the Father and the Son to be always with His children, He extends spiritual gifts to the church, empowers it to bear witness to Christ, and in harmony with the Scriptures leads it into all truth. (Gen. 1:1, 2; Luke 1:35; 4:18; Acts 10:38; 2 Peter 1:21; 2 Cor. 3:18; Eph. 4:11, 12; Acts 1:8; John 14:16-18, 26; 15:26, 27; 16:7-13.)

6. Creation:

God is Creator of all things, and has revealed in Scripture the authentic account of His creative activity. In six days the Lord made "the heaven and the earth" and all living things upon the earth, and rested on the seventh day of that first week. Thus He established the Sabbath as a perpetual memorial of His completed creative work. The first man and woman were made in the image of God as the crowning work of Creation, given dominion over the world, and charged with responsibility to care for it. When the world was finished it was "very good," declaring the glory of God. (Gen. 1; 2; Ex. 20:8-11; Ps. 19:1-6; 33:6, 9; 104; Heb. 11:3.)

7. Nature of Man:

Man and woman were made in the image of God with individuality, the power and freedom to think and to do. Though created free beings, each is an indivisible unity of body, mind, and spirit, dependent upon God for life and breath and all else. When our first parents disobeyed God, they denied their dependence upon Him and fell from their high position under God. The image of God in them was marred and they became subject to death. Their descendants share this fallen nature and its consequences. They are born with weaknesses and tendencies to evil. But God in Christ reconciled the world to Himself and by His Spirit restores in penitent mortals the image of their Maker. Created for the glory of God, they are called to love Him

and one another, and to care for their environment. (Gen. 1:26-28; 2:7; Ps. 8:4-8; Acts 17:24-28; Gen. 3; Ps. 51:5; Rom. 5:12-17; 2 Cor. 5:19, 20; Ps. 51:10; 1 John 4:7, 8, 11, 20; Gen. 2:15.)

8. Great Controversy:

All humanity is now involved in a great controversy between Christ and Satan regarding the character of God, His law, and His sovereignty over the universe. This conflict originated in heaven when a created being, endowed with freedom of choice, in self-exaltation became Satan, God's adversary, and led into rebellion a portion of the angels. He introduced the spirit of rebellion into this world when he led Adam and Eve into sin. This human sin resulted in the distortion of the image of God in humanity, the disordering of the created world, and its eventual devastation at the time of the worldwide flood. Observed by the whole creation, this world became the arena of the universal conflict, out of which the God of love will ultimately be vindicated. To assist His people in this controversy, Christ sends the Holy Spirit and the loyal angels to guide, protect, and sustain them in the way of salvation. (Rev. 12:4-9; Isa. 14:12-14; Eze. 28:12-18; Gen. 3; Rom. 1:19-32; 5:12-21; 8:19-22; Gen. 6-8; 2 Peter 3:6; 1 Cor. 4:9; Heb. 1:14.)

9. Life, Death, and Resurrection of Christ:

In Christ's life of perfect obedience to God's will, His suffering, death, and resurrection, God provided the only means of atonement for human sin, so that those who by faith accept this atonement may have eternal life, and the whole creation may better understand the infinite and holy love of the Creator. This perfect atonement vindicates the righteousness of God's law and the graciousness of His character; for it both condemns our sin and provides for our forgiveness. The death of Christ is substitutionary and expiatory, reconciling and transforming. The resurrection of Christ proclaims God's triumph over the forces of evil, and for those who accept the atonement assures their final victory over sin and death. It declares the Lordship of Jesus Christ, before whom every knee in heaven and on earth will bow. (John

3:16; Isa. 53; 1 Peter 2:21, 22; 1 Cor. 15:3, 4, 20-22; 2 Cor. 5:14, 15, 19-21; Rom. 1:4; 3:25; 4:25; 8:3, 4; 1 John 2:2; 4:10; Col. 2:15; Phil. 2:6-11.)

10. Experience of Salvation:

In infinite love and mercy God made Christ, who knew no sin, to be sin for us, so that in Him we might be made the righteousness of God. Led by the Holy Spirit we sense our need, acknowledge our sinfulness, repent of our transgressions, and exercise faith in Jesus as Lord and Christ, as Substitute and Example. This faith which receives salvation comes through the divine power of the Word and is the gift of God's grace. Through Christ we are justified, adopted as God's sons and daughters, and delivered from the lordship of sin. Through the Spirit we are born again and sanctified; the Spirit renews our minds, writes God's law of love in our hearts, and we are given the power to live a holy life. Abiding in Him we become partakers of the divine nature and have the assurance of salvation now and in the judgment. (2 Cor. 5:17-21; John 3:16; Gal. 1:4; 4:4-7; Titus 3:3-7; John 16:8; Gal. 3:13, 14; 1 Peter 2:21, 22; Rom. 10:17; Luke 17:5; Mark 9:23, 24; Eph. 2:5-10; Rom. 3:21-26; Col. 1:13, 14; Rom. 8:14-17; Gal. 3:26; John 3:3-8; 1 Peter 1:23; Rom. 12:2; Heb. 8:7-12; Eze. 36:25-27; 2 Peter 1:3, 4; Rom. 8:1-4; 5:6-10.)

11. Growing in Christ:

By His death on the cross Jesus triumphed over the forces of evil. He who subjugated the demonic spirits during His earthly ministry has broken their power and made certain their ultimate doom. Jesus' victory gives us victory over the evil forces that still seek to control us, as we walk with Him in peace, joy, and assurance of His love. Now the Holy Spirit dwells within us and empowers us. Continually committed to Jesus as our Saviour and Lord, we are set free from the burden of our past deeds. No longer do we live in the darkness, fear of evil powers, ignorance, and meaninglessness of our former way of life. In this new freedom in Jesus, we are called to grow into the likeness of His character, communing with Him daily in prayer, feeding on His Word, meditating on it and on His providence, singing His praises,

gathering together for worship, and participating in the mission of the Church. As we give ourselves in loving service to those around us and in witnessing to His salvation, His constant presence with us through the Spirit transforms every moment and every task into a spiritual experience. (Ps 1:1, 2; 23:4; 77:11, 12; Col 1:13, 14; 2:6, 14, 15; Luke 10:17-20; Eph 5:19, 20; 6:12-18; 1 Thess 5:23; 2 Peter 2:9; 3:18; 2 Cor. 3:17, 18; Phil 3:7-14; 1 Thess 5:16-18; Matt 20:25-28; John 20:21; Gal 5:22-25; Rom 8:38, 39; 1 John 4:4; Heb 10:25.)

12. Church:

The church is the community of believers who confess Jesus Christ as Lord and Saviour. In continuity with the people of God in Old Testament times, we are called out from the world; and we join together for worship, for fellowship, for instruction in the Word, for the celebration of the Lord's Supper, for service to all mankind, and for the worldwide proclamation of the gospel. The church derives its authority from Christ, who is the incarnate Word, and from the Scriptures, which are the written Word. The church is God's family; adopted by Him as children, its members live on the basis of the new covenant. The church is the body of Christ, a community of faith of which Christ Himself is the Head. The church is the bride for whom Christ died that He might sanctify and cleanse her. At His return in triumph, He will present her to Himself a glorious church, the faithful of all the ages, the purchase of His blood, not having spot or wrinkle, but holy and without blemish. (Gen. 12:3; Acts 7:38; Eph. 4:11-15; 3:8-11; Matt. 28:19, 20; 16:13-20; 18:18; Eph. 2:19-22; 1:22, 23; 5:23-27; Col. 1:17, 18.)

13. Remnant and Its Mission:

The universal church is composed of all who truly believe in Christ, but in the last days, a time of widespread apostasy, a remnant has been called out to keep the commandments of God and the faith of Jesus. This remnant announces the arrival of the judgment hour, proclaims salvation through Christ, and heralds the approach of His second advent. This proclamation is symbolized by the three angels of Revelation 14; it coincides with the work of judgment in

heaven and results in a work of repentance and reform on earth. Every believer is called to have a personal part in this worldwide witness. (Rev. 12:17; 14:6-12; 18:1-4; 2 Cor. 5:10; Jude 3, 14; 1 Peter 1:16-19; 2 Peter 3:10-14; Rev. 21:1-14.)

14. Unity in the Body of Christ:

The church is one body with many members, called from every nation, kindred, tongue, and people. In Christ we are a new creation; distinctions of race, culture, learning, and nationality, and differences between high and low, rich and poor, male and female, must not be divisive among us. We are all equal in Christ, who by one Spirit has bonded us into one fellowship with Him and with one another; we are to serve and be served without partiality or reservation. Through the revelation of Jesus Christ in the Scriptures we share the same faith and hope, and reach out in one witness to all. This unity has its source in the oneness of the triune God, who has adopted us as His children. (Rom. 12:4, 5; 1 Cor. 12:12-14; Matt. 28:19, 20; Ps. 133:1; 2 Cor. 5:16, 17; Acts 17:26, 27; Gal. 3:27, 29; Col. 3:10-15; Eph. 4:14-16; 4:1-6; John 17:20-23.)

15. Baptism:

By baptism we confess our faith in the death and resurrection of Jesus Christ, and testify of our death to sin and of our purpose to walk in newness of life. Thus we acknowledge Christ as Lord and Saviour, become His people, and are received as members by His church. Baptism is a symbol of our union with Christ, the forgiveness of our sins, and our reception of the Holy Spirit. It is by immersion in water and is contingent on an affirmation of faith in Jesus and evidence of repentance of sin. It follows instruction in the Holy Scriptures and acceptance of their teachings. (Rom. 6:1-6; Col. 2:12, 13; Acts 16:30-33; 22:16; 2:38; Matt. 28:19, 20.)

16. Lord's Supper:

The Lord's Supper is a participation in the emblems of the body and blood of Jesus as an expression of faith in Him, our Lord and Saviour. In this experience of communion Christ is present to meet and strengthen His people. As we partake, we joyfully proclaim the Lord's

death until He comes again. Preparation for the Supper includes self-examination, repentance, and confession. The Master ordained the service of foot washing to signify renewed cleansing, to express a willingness to serve one another in Christlike humility, and to unite our hearts in love. The communion service is open to all believing Christians. (1 Cor. 10:16, 17; 11:23-30; Matt. 26:17-30; Rev. 3:20; John 6:48-63; 13:1-17.)

17. Spiritual Gifts and Ministries:

God bestows upon all members of His church in every age spiritual gifts which each member is to employ in loving ministry for the common good of the church and of humanity. Given by the agency of the Holy Spirit, who apportions to each member as He wills, the gifts provide all abilities and ministries needed by the church to fulfill its divinely ordained functions. According to the Scriptures, these gifts include such ministries as faith, healing, prophecy, proclamation, teaching, administration, reconciliation, compassion, and self-sacrificing service and charity for the help and encouragement of people. Some members are called of God and endowed by the Spirit for functions recognized by the church in pastoral, evangelistic, apostolic, and teaching ministries particularly needed to equip the members for service, to build up the church to spiritual maturity, and to foster unity of the faith and knowledge of God. When members employ these spiritual gifts as faithful stewards of God's varied grace, the church is protected from the destructive influence of false doctrine, grows with a growth that is from God, and is built up in faith and love. (Rom. 12:4-8; 1 Cor. 12:9-11, 27, 28; Eph. 4:8, 11-16; Acts 6:1-7; 1 Tim. 3:1-13; 1 Peter 4:10, 11.)

18. The Gift of Prophecy:

One of the gifts of the Holy Spirit is prophecy. This gift is an identifying mark of the remnant church and was manifested in the ministry of Ellen. G. White . As the Lord's messenger, her writings are a continuing and authoritative source of truth which provide for the church comfort, guidance, instruction, and correction. They also make clear that the Bible is the

standard by which all teaching and experience must be tested. (Joel 2:28, 29; Acts 2:14-21; Heb. 1:1-3; Rev. 12:17; 19:10.)

19. Law of God:

The great principles of God's law are embodied in the Ten Commandments and exemplified in the life of Christ. They express God's love, will, and purposes concerning human conduct and relationships and are binding upon all people in every age. These precepts are the basis of God's covenant with His people and the standard in God's judgment. Through the agency of the Holy Spirit they point out sin and awaken a sense of need for a Saviour. Salvation is all of grace and not of works, but its fruitage is obedience to the Commandments. This obedience develops Christian character and results in a sense of well-being. It is an evidence of our love for the Lord and our concern for our fellow men. The obedience of faith demonstrates the power of Christ to transform lives, and therefore strengthens Christian witness. (Ex. 20:1-17; Ps. 40:7, 8; Matt. 22:36-40; Deut. 28:1-14; Matt. 5:17-20; Heb. 8:8-10; John 15:7-10; Eph. 2:8-10; 1 John 5:3; Rom. 8:3, 4; Ps. 19:7-14.)

20. Sabbath:

The beneficent Creator, after the six days of Creation, rested on the seventh day and instituted the Sabbath for all people as a memorial of Creation. The fourth commandment of God's unchangeable law requires the observance of this seventh-day Sabbath as the day of rest, worship, and ministry in harmony with the teaching and practice of Jesus, the Lord of the Sabbath. The Sabbath is a day of delightful communion with God and one another. It is a symbol of our redemption in Christ, a sign of our sanctification, a token of our allegiance, and a foretaste of our eternal future in God's kingdom. The Sabbath is God's perpetual sign of His eternal covenant between Him and His people. Joyful observance of this holy time from evening to evening, sunset to sunset, is a celebration of God's creative and redemptive acts. (Gen. 2:1-3; Ex. 20:8-11; Luke 4:16; Isa. 56:5, 6; 58:13, 14; Matt. 12:1-12; Ex. 31:13-17; Eze. 20:12, 20; Deut. 5:12-15; Heb. 4:1-11; Lev. 23:32; Mark 1:32.)

21. Stewardship:

We are God's stewards, entrusted by Him with time and opportunities, abilities and possessions, and the blessings of the earth and its resources. We are responsible to Him for their proper use. We acknowledge God's ownership by faithful service to Him and our fellow men, and by returning tithes and giving offerings for the proclamation of His gospel and the support and growth of His church. Stewardship is a privilege given to us by God for nurture in love and the victory over selfishness and covetousness. The steward rejoices in the blessings that come to others as a result of his faithfulness. (Gen. 1:26-28; 2:15; 1 Chron. 29:14; Haggai 1:3-11; Mal. 3:8-12; 1 Cor. 9:9-14; Matt. 23:23; 2 Cor. 8:1-15; Rom. 15:26, 27.)

22. Christian Behavior:

We are called to be a godly people who think, feel, and act in harmony with the principles of heaven. For the Spirit to recreate in us the character of our Lord we involve ourselves only in those things which will produce Christlike purity, health, and joy in our lives. This means that our amusement and entertainment should meet the highest standards of Christian taste and beauty. While recognizing cultural differences, our dress is to be simple, modest, and neat, befitting those whose true beauty does not consist of outward adornment but in the imperishable ornament of a gentle and quiet spirit. It also means that because our bodies are the temples of the Holy Spirit, we are to care for them intelligently. Along with adequate exercise and rest, we are to adopt the most healthful diet possible and abstain from the unclean foods identified in the Scriptures. Since alcoholic beverages, tobacco, and the irresponsible use of drugs and narcotics are harmful to our bodies, we are to abstain from them as well. Instead, we are to engage in whatever brings our thoughts and bodies into the discipline of Christ, who desires our wholesomeness, joy, and goodness. (Rom. 12:1, 2; 1 John 2:6; Eph. 5:1-21; Phil. 4:8; 2 Cor. 10:5; 6:14-7:1; 1 Peter 3:1-4; 1 Cor. 6:19, 20; 10:31; Lev. 11:1-47; 3 John 2.)

23. Marriage and the Family:

Marriage was divinely established in Eden and affirmed by Jesus to be a lifelong union between a man and a woman in loving companionship. For the Christian a marriage commitment is to God as well as to the spouse, and should be entered into only between partners who share a common faith. Mutual love, honor, respect, and responsibility are the fabric of this relationship, which is to reflect the love, sanctity, closeness, and permanence of the relationship between Christ and His church. Regarding divorce, Jesus taught that the person who divorces a spouse, except for fornication, and marries another, commits adultery. Although some family relationships may fall short of the ideal, marriage partners who fully commit themselves to each other in Christ may achieve loving unity through the guidance of the Spirit and the nurture of the church. God blesses the family and intends that its members shall assist each other toward complete maturity. Parents are to bring up their children to love and obey the Lord. By their example and their words they are to teach them that Christ is a loving disciplinarian, ever tender and caring, who wants them to become members of His body, the family of God. Increasing family closeness is one of the earmarks of the final gospel message. (Gen. 2:18-25; Matt. 19:3-9; John 2:1-11; 2 Cor. 6:14; Eph. 5:21-33; Matt. 5:31, 32; Mark 10:11, 12; Luke 16:18; 1 Cor. 7:10, 11; Ex. 20:12; Eph. 6:1-4; Deut. 6:5-9; Prov. 22:6; Mal. 4:5, 6.)

24. Christ's Ministry in the Heavenly Sanctuary:

There is a sanctuary in heaven, the true tabernacle which the Lord set up and not man. In it Christ ministers on our behalf, making available to believers the benefits of His atoning sacrifice offered once for all on the cross. He was inaugurated as our great High Priest and began His intercessory ministry at the time of His ascension. In 1844, at the end of the prophetic period of 2300 days, He entered the second and last phase of His atoning ministry. It is a work of investigative judgment which is part of the ultimate disposition of all sin, typified by the cleansing of the ancient Hebrew sanctuary on the Day of Atonement. In that typical service the sanctuary was cleansed with the blood of animal sacrifices, but the

heavenly things are purified with the perfect sacrifice of the blood of Jesus. The investigative judgment reveals to heavenly intelligences who among the dead are asleep in Christ and therefore, in Him, are deemed worthy to have part in the first resurrection. It also makes manifest who among the living are abiding in Christ, keeping the commandments of God and the faith of Jesus, and in Him, therefore, are ready for translation into His everlasting kingdom. This judgment vindicates the justice of God in saving those who believe in Jesus. It declares that those who have remained loyal to God shall receive the kingdom. The completion of this ministry of Christ will mark the close of human probation before the Second Advent. (Heb. 8:1-5; 4:14-16; 9:11-28; 10:19-22; 1:3; 2:16, 17; Dan. 7:9-27; 8:13, 14; 9:24-27; Num. 14:34; Eze. 4:6; Lev. 16; Rev. 14:6, 7; 20:12; 14:12; 22:12.)

25. Second Coming of Christ:

The second coming of Christ is the blessed hope of the church, the grand climax of the gospel. The Saviour's coming will be literal, personal, visible, and worldwide. When He returns, the righteous dead will be resurrected, and together with the righteous living will be glorified and taken to heaven, but the unrighteous will die. The almost complete fulfillment of most lines of prophecy, together with the present condition of the world, indicates that Christ's coming is imminent. The time of that event has not been revealed, and we are therefore exhorted to be ready at all times. (Titus 2:13; Heb. 9:28; John 14:1-3; Acts 1:9-11; Matt. 24:14; Rev. 1:7; Matt. 24:43, 44; 1 Thess. 4:13-18; 1 Cor. 15:51-54; 2 Thess. 1:7-10; 2:8; Rev. 14:14-20; 19:11-21; Matt. 24; Mark 13; Luke 21; 2 Tim. 3:1-5; 1 Thess. 5:1-6.)

26. Death and Resurrection:

The wages of sin is death. But God, who alone is immortal, will grant eternal life to His redeemed. Until that day death is an unconscious state for all people. When Christ, who is our life, appears, the resurrected righteous and the living righteous will be glorified and caught up to meet their Lord. The second resurrection, the resurrection of the unrighteous,

will take place a thousand years later. (Rom. 6:23; 1 Tim. 6:15, 16; Eccl. 9:5, 6; Ps. 146:3, 4; John 11:11-14; Col. 3:4; 1 Cor. 15:51-54; 1 Thess. 4:13-17; John 5:28, 29; Rev. 20:1-10.)

27. Millennium and the End of Sin:

The millennium is the thousand-year reign of Christ with His saints in heaven between the first and second resurrections. During this time the wicked dead will be judged; the earth will be utterly desolate, without living human inhabitants, but occupied by Satan and his angels. At its close Christ with His saints and the Holy City will descend from heaven to earth. The unrighteous dead will then be resurrected, and with Satan and his angels will surround the city; but fire from God will consume them and cleanse the earth. The universe will thus be freed of sin and sinners forever. (Rev. 20; 1 Cor. 6:2, 3; Jer. 4:23-26; Rev. 21:1-5; Mal. 4:1; Eze. 28:18, 19.)

28. New Earth:

On the new earth, in which righteousness dwells, God will provide an eternal home for the redeemed and a perfect environment for everlasting life, love, joy, and learning in His presence. For here God Himself will dwell with His people, and suffering and death will have passed away. The great controversy will be ended, and sin will be no more. All things, animate and inanimate, will declare that God is love; and He shall reign forever. Amen. (2 Peter 3:13; Isa. 35; 65:17-25; Matt. 5:5; Rev. 21:1-7; 22:1-5; 11:15.) Seventh-day Adventists accept the Bible as their only creed and hold certain fundamental beliefs to be the teaching of the Holy Scriptures. These beliefs, as set forth here, constitute the church's understanding and expression of the teaching of Scripture. Revision of these statements may be expected at a General Conference session when the church is led by the Holy Spirit to a fuller understanding of Bible truth or finds better language in which to express the teachings of God's Holy Word.

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