FADING MNEMONICS AND DIGITAL DECAY

An Exploration of 'Memory' and 'Decay' as Metaphors
Enforced upon our Virtual Realm

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CONTENTS

INTRODUCTION

The relationship between humanity and its computers is imperative. Analogy and metaphor have engulfed the digital realm since it came into existence.

We have enforced human analogy into our software and expect human traits in return, yet *'folders'*, *'files'* and *'desktops'* all essentially refer to the same thing – bits and bytes of pure, apathetic, binary data. There are two metaphors which stand above all others in their prominence as symbols of human characteristics with which we refer to our digital world. These are *'Memory'* and *'Decay'*. This project attempts to explore these metaphors and asks the consequences of these digital analogies behaving more akin to their physical, human namesakes. What if digital memory was poetic and nostalgic? What if digital decay was entropic and creative?

The accumulation of the project was a week-long installation held in P3 Ambika, a huge events hall situated in the depths of Westminster University's labyrinthine basement. The installation consisted of a camera-projector loop, a live camera feed was rear-projected onto a screen. This feed was gradually *'digitally decayed'* over the length of the installation, and upon a visitor entering the space, a short recording was triggered and saved to a pool. Random recordings were drawn from this pool at increasingly frequent intervals and overlaid into the live projection feed. Recognizable recordings eventually melt into a psychedelic vortex of shifting pixels. Visitors share the space with its previous occupants, even with a past, lesser-decayed incarnation of themselves. A small portal between the physical realm and the digital realm is opened.

SECTION ONE
METAPHOR AND ANALOGY IN THE DIGITAL REALM

The relationship between memory and decay and their use as metaphors for describing digital concepts

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Memory and decay exist in an inextricable relationship. Without memory, it is questionable as to whether decay exists, as there would be no recollection of the existence of an object in any other form than its current. Without decay, can memory exist? If nothing ever changes then one can never have a record of something in a previous state.

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Memory is the metaphor most widely and commonly used in the digital world. Until only twenty years or so ago the word memory denoted the human ability to recall past experiences and learnings, however with the rapid shift of our culture into the digital realm, asking a teenager to consider the word *'memory'* would likely turn their thoughts to a hard drive as much as it would to a past event they had experienced. Such is the power and pertinence of this metaphor.

Decay is a far newer and lesser-explored metaphor than memory, but one of equal importance. We are all aware of the decay that exists in our physical world, we are exposed to degradation, death and destruction frequently. We still struggle however with the concept of decay in the digital sense. We forget what we have been taught, but we do not expect our computer to forget what we have used it to create. Our physical possessions decay over time, but we do not expect this of our digital possessions. Are the little software glitches and the operating system crashes decay in the digital sense?

It is imperative that we begin to understand decay from a digital point of view, living as we do in a world that could in theory have the record of its recent history completely wiped out by a rogue Trojan horse (yet another metaphor).

1.A
The Decay of East London
(http://tr.im/xqwi)

1.B
Smashed Mac, courtesy of Jessica Elgin
(http://tr.im/xobQ)

SECTION TWO THE ART OF MEMORY IN THE AGE OF MECHANICAL REPRODUCTION

Ancient mnemonic training techniques via spatial association from Yate's 'The Art of Memory' and Benjamin's thoughts on reproduction of information from 'The Work of Art in the Age of Mechanical Reproduction'

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In The Art of Memory, Frances A. Yates refers to the book Ad Herennium, a document on rhetoric dating to circa 86-82 BC by an unknown Roman teacher:

"When he comes to memory as an essential part of the orator's equipment, he opens his treatment of it with the words 'Now let us turn to the treasure-house of inventions, the custodian of all parts of the rhetoric, memory.' There are two kinds of memory, he continues, one natural, the other artificial. The natural memory is that which is engrafted in our minds, born simultaneously with thought. The artificial memory is a memory strengthened or confirmed by training." [2.1]

In the times of antiquity, long before the invention of computers or even of literacy, scholars would employ complex techniques in order to memorize stories, speeches and events. The Art of Memory was said to have been invented by poet Simonides of Ceos whilst performing at the banquet of Scopas, a nobleman of Thessaly. The poet dedicated the first half of his chant to his

host, and the latter part to the twin gods Castor and Pollux. Scopas then paid the poet only half of the agreed fee, and suggested that he demanded the rest of the payment from the gods. A little later a message was sent to Simonides telling him that two young men were waiting outside to speak to him. Upon leaving the banquet, Simonides could find no one, but during his absence, the roof of the building collapsed, crushing everyone inside to their deaths. The bodies were so heavily mangled that the relatives could not tell them apart, but Simonides was able to remember every single guest from the position at which they were seated around the table. The twin gods had paid their share handsomely. Simonides realized how essential orderly arrangement was for a good memory.

This association of memory with physical space became imperative, and techniques were established to allow one to memorize vast amounts by mentally placing images in physical spaces. The artificial memory the unknown teacher refers to consists of images and places. A *'locus'* is a place which is easily memorable, such as a family home. The method involves pacing this locus, either mentally or physically, room by room and placing an image which is to be remembered in each room. Later, for instance when delivering a speech, the individual takes a mental journey through this locus, demanding from each room what he has mentally stored there. The images placed in each room must be as explicit and powerful as possible. Scenes that shock are most likely to be remembered, and so relating an image to, say, a scene of bloody battle works particularly well. Cicero defined two types of memory, not memory as in the style of memorizing, but memory as in the material that needs to be memorised. He defined the first as the memory of *'things'*, and the second the memory of *'words'*. Both *'things'* and *'words'* could be memorised using the spatial association techniques. [2.2]

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If we ponder memory and its modern meanings we reach a crossroads. Memory now refers as much to a computer's storage capacity as it does to that of our own brains, but the two memories are very dissimilar.

Human memory is poetic, it is nostalgic and entropic. Patches come, patches go, we forget both intentionally and unintentionally and we often are unable to erase an unwanted memory. Over time our memories are altered, they develop with the individual, they become amplified and even fabricated. Each individual memorizes an event in his or her own, often very different way. Digital memory is the polar opposite. It is clean and pristine, it is simple in its binary form. It is a series of 1's and 0's which either exists or does not. Digital memory can be copied, replicated and backed up, time after time, each version as perfect as the very first.

There are undeniable associations to be mentioned at this point with Walter Benjamin's *The Work of Art in the Age of Mechanical Reproduction*. Benjamin talks of how prior to the age of mechanical reproduction works of art could never be replicated identically.[2.3] The original maintained its uniqueness. With the invention of printing, however, work could repeatedly be copied identically. The original somewhat began to loose its importance. Relating this idea to the concept of memory, the computer now acts like the printing press, making exact duplicates of data, each identical to the very first, whilst human memory is an analogy for the manual replication of data. Just as a master painter trains his pupil by having him copy his paintings, one individual passes on a memory to another by means of articulating this memory verbally. In each case, the replication will never be identical. The copied painting will have minor differences from the original, although these will not necessarily result in the copy being worse, and likewise the individual to which the memory has been passed onto will have a somewhat different understanding of it to the individual who initially experienced it, having to use their imagination to replicate the described events mentally.

2.1
Yates, Frances A, The Art of Memory, 1966 — page 20

2.2
Yates, The Art of Memory, — page 22–23

2.3
Benjamin, Walter, The Work of Art in the Age of Mechanical Reproduction, 1935 — page 2-3 (http://tr.im/xm97)

2.A
The Memory Theatre of Giulio Camillo based on L'Idea del Theatro, from Yate's The Art of Memory

2.B
Brain Scan, courtesy of Liz Henry (http://tr.im/xocF)

2.C
Harddrive, courtesy of Ace0fClub5 (http://tr.im/xod3)
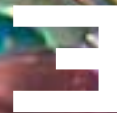
2.D
Type Press, via Wikipedia (http://tr.im/xodp)

2.B

2.C

2.D
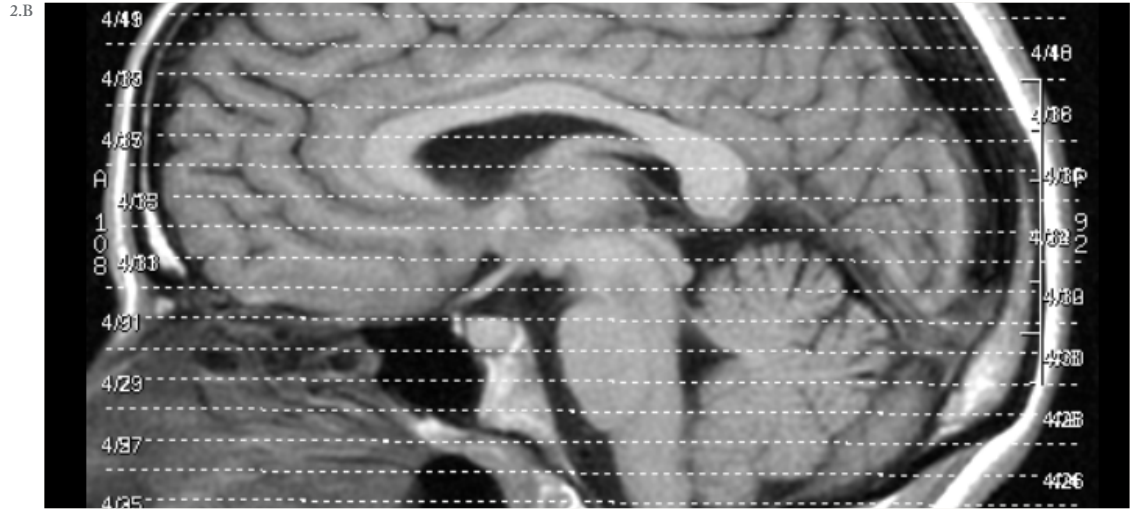
SECTION THREE

THE PARADOX OF PRESERVATION

The concerns over the rapid digitisation of our culture and the importance of preserving our digital data by preserving its storage media

Benjamin goes further to describe the impact of photography upon lithography, which on its invention all but handed lithography its redundancy. [3.1]

As a result, the lithograph almost ceased to exist due to its means of creation expiring. We are facing similar problems with our digital media, the storage formats of which have worryingly ephemeral life spans.

We are told that the bytes that comprise an image can never decay in the physical sense, they do not age. As long as they have the media to exist upon, and there is no enforced destruction (deletion, viruses, etc) they will exist in their original form.
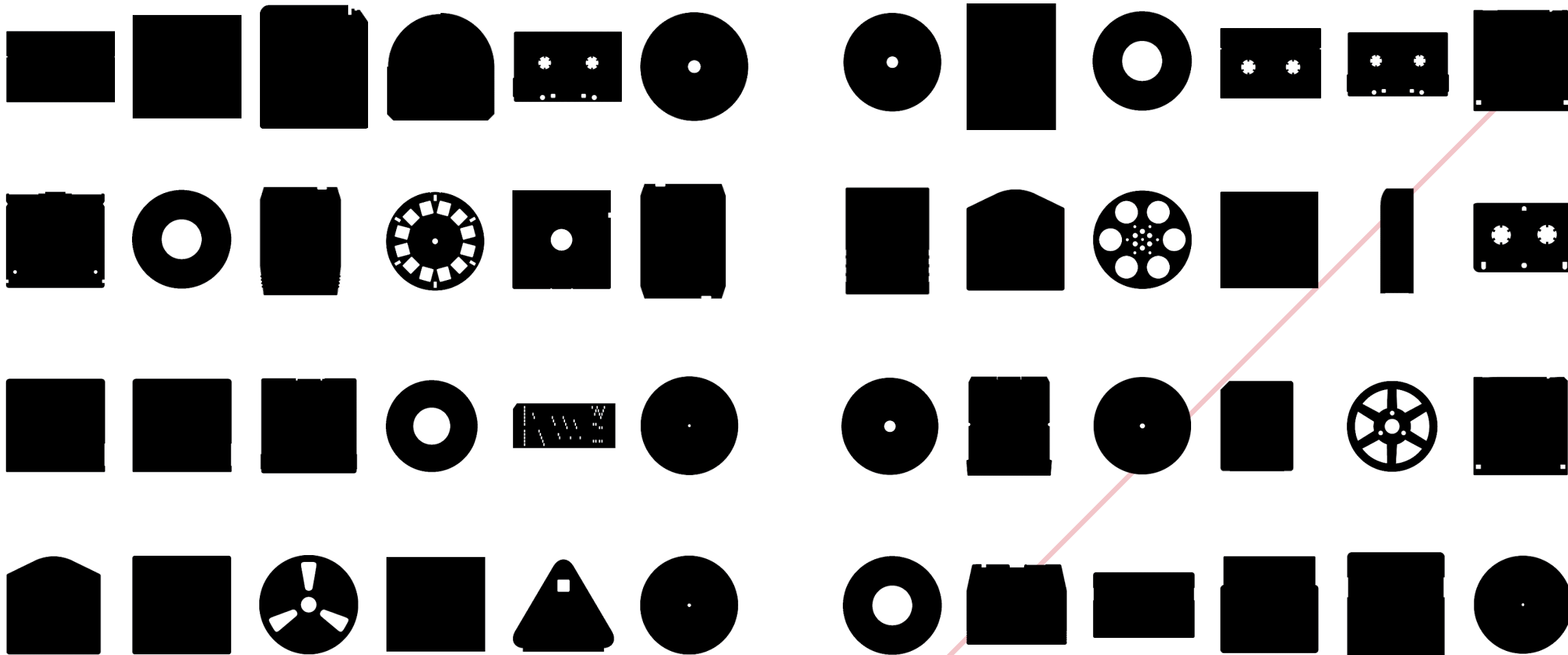
The Lost Formats Preservation Society, Experimental Jetset (http://tr.im/xogj)
Documentation of media storage formats which are no longer in use.

Bruce Sterling is a science fiction author and in March 2001 gave a keynote address titled Preserving the Immaterial: A Conference on Variable Media at New York's Guggenheim Museum.

This seems to be one of the first formal documentations of *'digital decay'* being considered, and proves to be a somewhat worrying chain of thoughts. Sterling talks of the epic shift towards the digitisation of our civilisation and its associated, but generally ignored concerns.

This common perception that our data is safe as long as we have a digital back up of it is dangerous. He suggests it is not the material we must preserve, but the immaterial. Our CDs, hard-drives and shiny new iMacs will eventually fall to pieces, but it is the pure binary data that we strive to maintain, the 1s and 0s. It is easy to back up this data, but the danger is the advancing pace of technology itself. File formats become obsolete, components become incompatible, and data becomes unreadable. The computer becomes **"an emulator of an emulator's emulator"**. [3.2]

Sterling goes on to consider the dilemma of preservation as a form of decay. Of course our priceless paintings and sculptures would last many decades longer if they were stored in environmentally controlled boxes, but what would the point in their existence be if the public could not view them?

"The final painful paradox lies in harming what we save, as we try to save it. Preservation is itself a source of hazard. We dropped the precious china while we were dusting it. We tripped and split the old painting frame. We tried to fix that old book with tape and rubber cement. Entropy requires no maintenance. Entropy has its own poetry: it's all about delamination, disintegration, deterioration, degeneration, decomposition, and doddering decline." [3.3]

Whereas we develop complex and incredibly expensive methods to preserve our physical media, we have relatively simple methods of protecting our digital data. Paintings and ancient texts are stored in environmentally controlled boxes to ensure

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that damage from strong light, extreme temperature and humidity is kept to a minimum, whilst our methods of preserving our digital data consists primarily of simply creating back-ups. One notable method of error detection in digital data is the parity bit, an optional additional parameter incorporated into a binary character to determine whether the remote device has correctly received transmitted data. Depending on the type of the parity bit, either a 1 or a 0 will be added to the binary chain in order to make the total number of 1s either odd or even. For example if the letter *'a'* (binary 1100001) is transmitted with even parity, the parity bit would read *'1'*, making a total number of four 1s, an even number. If the chain were mistakenly received as 1000001, yet the parity bit read 1, the system would read an error, as the total amount of 1s would be 3, an odd total. The key difference here is that parity is an error detection system, and not an error prevention system, or even an error correction system. [3.4]

But maybe the unexpected software glitches are a metaphor

for digital aging, or even digital imagination. Maybe a virus is to a byte of data what Cancer is to a human cell. The differences in decay in the physical sense and in the digital sense mirror the differences between memory in the human sense and memory in the digital sense. Physical decay is slow but certain, it is expected and often encouraged. Like human memory, it is nostalgic and entropic. Conversely, the decay of digital data is sudden and abrupt. Like its binary polarity, it either works or it does not.

3.1
Benjamin, The Work of Art in the Age of Mechanical Reproduction — page 2

3.2
Sterling, **Bruce**, Digital Decay, 2001 — page 21 (http://tr.im/xmaC)

3.3
Sterling, **Bruce**, Digital Decay, 2001 — page 14

3.4
IBM, Parity Bits, 2008

3.A
Data Dump, Courtesy of Seth Anderson (http://tr.im/xofy)

3.B
Shattered Vases, Courtesy of Nathan Osborn (http://tr.im/xolr)

404 FILE NOT FOUND AND THE DIGITAL CHERNOBYL

Wein's 'Fleetingness of Bits', the unprecedented volume of digital information we store and the defunct webpage as a metaphor for an abandoned city

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The Fleetingness of Bits (2000)[4.1] is a website by Melanie Wein as part of a thesis project which questions the enormous quantities of digital information we store and randomly lose each year.

The piece predates Sterling's by a year and appears to be the earliest substantial consideration of digital decay and its respective problems available either online or in printed media. Wein questions whether the storage formats we are using to transfer our culture to future generations are actually adequate for doing so, and expresses concern over the blind digitisation currently taking place, quoting Danny Hillis and Doug Carlston:

"…from previous ages we have good raw data written on clay, on stone, on parchment and paper, but from the 1950s to the present recorded information increasingly disappears into a digital gap. Historians will consider this a dark age." (Danny Hillis)[4.2]

Not Found

The requested URL /ERROR was not found o

Additionally, a 404 Not Found error was encou

Apache/1.3.41 Server at rafoli

4.A, 4.B

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"It is estimated that since 1945 we have created and stored one hundred times as much information as we did in all of human history up until that time!" (Doug Carlston)[4.3]

Wein talks about the vast amount of digital storage space humanity fills each year — the Library of Congress alone preserves around 3,000 TB (3 Pentabytes) of collected human knowledge (in the year 1998). In 1998, the digital information humanity was producing each year was less than the total amount of storage media that was created. By 1998 12 EB (1 exabyte = 1,000,000,000,000,000,000 bytes) of storage media had been sold, yet the annual production of digital information was only around 4.6 EB.

She also relates and compares her thinking on digital information to human memory, giving Professor Tom Landauer's estimation that "human beings have a long term life-span memory capacity of approximately 200 MB."[4.4] Wein further suggests that in a world of 6 billion people, this estimation means that the total global human memory amounts to 1,200 petabytes.

"But our brain does not consist of memory only. Vital functions of our brain include perception, filtering, reduction and evaluation. And forgetting is vital too, otherwise we would decline in our ability to retain information. These functions, as of yet, cannot be efficiently emulated by computer technologies." (Wein)[4.5]

Wein suggests that in an age when it is so easy to store information, we inevitably, blindly, store everything:

"It's evident that the more information is available, the less is kept in mind. Islands of attention are built: The rest is ignored and disappears somewhere in the digital nirvana." [4.6]

One can relate this thinking back to the types of memory defined by the ancients earlier. Human artificial memory has become de-valued to such an extent through digital media that one may question its use in today's society.

4.1
Wein, Melanie, The Fleetingness of Bits, 2000
(http://tr.im/xlDO)

4.2
Wein, The Fleetingness of Bits — Fear of Information Loss

4.3
Wein, The Fleetingness of Bits (home page)

4.4
Wein, The Fleetingness of Bits — Traditional Information

4.5
Wein, The Fleetingness of Bits — Traditional Information

4.6
Wein, The Fleetingness of Bits — End of Selection

4.A, 4.B
Wein, The Fleetingness of Bits, Screenshots

She goes on to talk about the Internet, and how, contrary to popular perception, it is a **"fleeting and transient medium"** [4.7], pages having an average life expectancy of roughly 75 days. The Internet's data is continuously removed and replaced, in tandem with new information being added.

The Internet is indeed a relevant example to consider when thinking of digital decay. Wein explains how **"The World Wide Web is like a huge labyrinth, where routes leading once to something now can disappear and sometimes end in the dead end "404 File Not Found"... This message is always an annoyance to the user but functions as a last hint that there had been something existing before. These documents are some of the few trails the online world carries in itself."** [4.8]

Wein talks about the Internet's **"forgotten and deserted web pages"** [4.9] containing broken images and applications which we frequently come across. She likens visiting these sites, where very few of the links still work, to entering a ghost city. One cannot help but envisage Chernobyl

as she describes how **"the date seems to be frozen, the updates stopped some time ago without a word of farewell"** [4.10].

Wein further hints at the comparison between the digital decay/memory and its physical/human equivalence—

"Now they are lying there: virtual ruins in the global network, being forgotten until they disappear one day without a trace, fallen out of conscience of the transient memory of the global brain." [4.11]

4.7 — 4.11
Wein, The Fleetingness of Bits — Traces on the Net

4.C
Pripyat Cultural Centre, courtesy of pennyjb (http://tr.im/xohm)

4.D
Pripyat Sports Equipment, courtesy of pennyjb (http://tr.im/xohq)

4.E
Pripyat Dodgem Cars, courtesy of pennyjb (http://tr.im/xoho)

She makes the somewhat daring claim that there is a poetic beauty in digital decay, and I find her use of a website to describe her project quite striking—

"Within the context of a webpage which naturally is also made up of bits and bytes, a poetic documentation of the digital decay in and about our culture is presented." [4.12]

Wein quotes Andy Grove— "digital information is forever. It doesn't deteriorate and requires little in the way of material media". [4.13]

This is perfectly true. We know digital information ultimately consists of binary ones and zeros, and these ones and zeros themselves cannot decay or degrade. This, however, does not mean the data that they create cannot be lost. If the means to store the data suffers from physical decay, if a hard disk is broken, if a file format becomes obsolete, then the data becomes useless. Wein goes on to compare this thought to that of human memory—

"But the hard truth is that our digital storage media have a shorter life-span than an old man with an excellent memory" [4.14]

On the one hand these thoughts have a striking similarity— one could compare digital data to human memory, compare the hard disk to the brain. Just as digital data becomes obsolete if its format is not transferred as technology advances, so do the old man's memories if he does not share them with others before he dies. If he does not tell his stories, they die with him. If digital data isn't backed up or transferred, it dies with the computer.

The discrepancy lies with the contrasting natures of digital data and human memory. Binary information exists in its original state up until the point at which the means to store or read it breaks down. At that point the data effectively ceases to exist. Its nature is polar in more than one sense. The human memory is different. It breaks down over time, parts are forgotten, lost forever, other parts are created to compensate. Stories become

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warped, memories become glamorized. The old man may still have his memories, but they will certainly be different now to the first time he experienced them.

What if there was a way of incorporating some of this entropic nature of the human memory into the digital world? What if a digital image taken a decade ago and left in a rarely opened archive file was not quite as pristine as the day it was taken? What if a story written as a Word file became warped over time— parts became lost, altered, dramatized?

Wein compares modern, digital media storage with the more traditional forms of storage such as parchment and stone tablature carvings. Whereas optical storage media will last a maximum of 100 years (more usually only 4), the Rosetta Stone has lasted millenniums. She talks of the difficulty of detecting physical decay within digital storage media, which leads ultimately to the data being lost, and ability of a single faulty bit to corrupt a whole file. [4.15]

4.12
Wein, The Fleetingness of Bits (project profile)

4.13 — 4.15
Wein, The Fleetingness of Bits — Digital Information is Transient
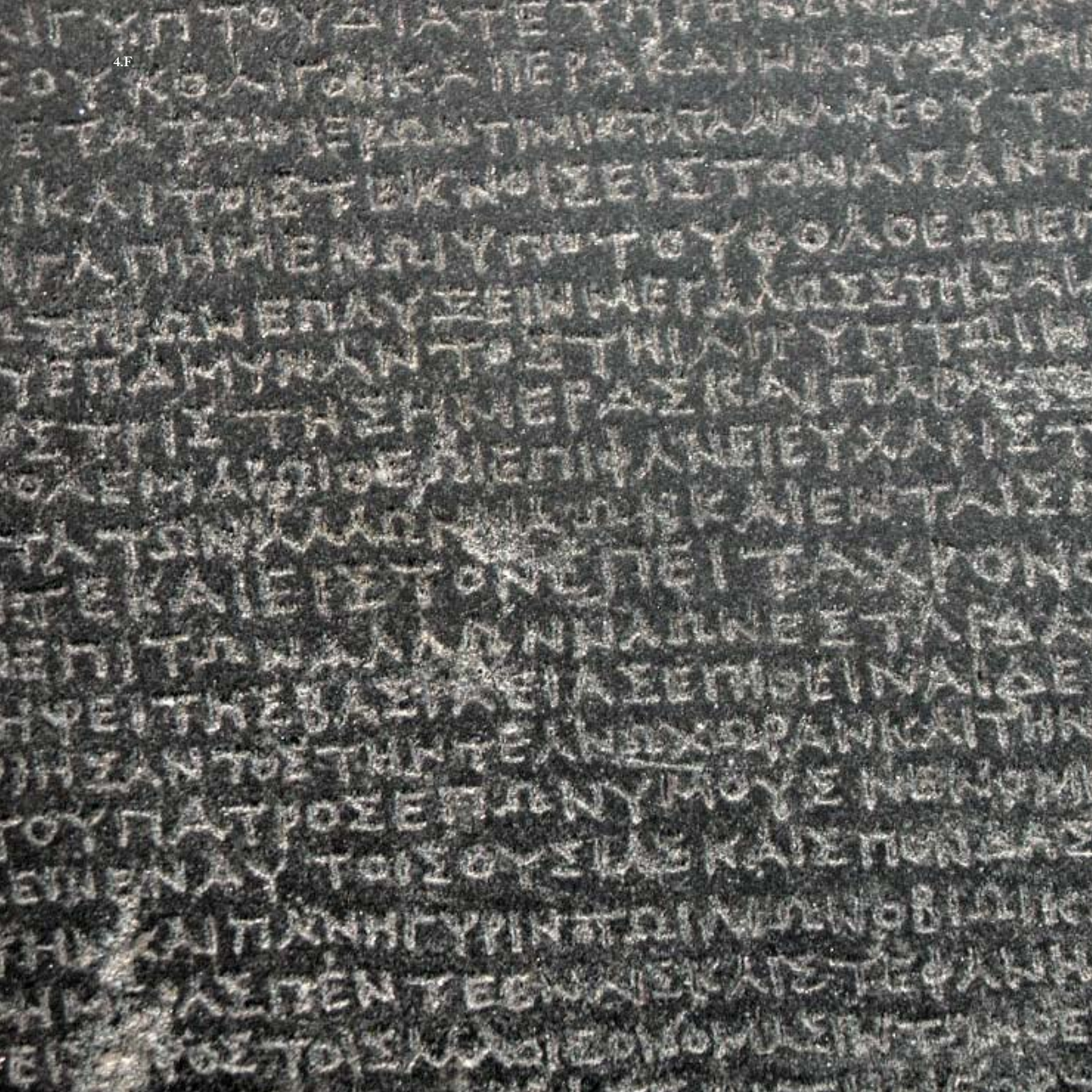
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There are huge problems with the way we are storing information. As file formats become obsolete, data needs to be transferred to updated formats. The more data we have, the more complicated and time consuming this conversion is. According to Wein's research, it would take NASA around 4 years to transfer all of the data they store to the new generation of digital media storage format. The life span of these new carriers however is only guaranteed for up to 6 years, so NASA would immediately have to begin transferring their data to the next generation of storage media upon completion. On top of all this is the incredible amount of new data that is added to the archives each year. [4.16]

Wein's association of a defunct website with an abandoned city is compelling. Just as the ancients used physical spaces as an analogy for human memory, today we do the same with the digital realm we have created. The Internet is the most powerful example, the term *'surfing'*, like *'memory'* is now entirely ambiguous. We see our web pages almost as buildings, which

we visit. We use 'windows' and click 'banners'. When we get a little lost, we click to go *'home'*. Enthrallingly, Wein's site, now 9 years old, possesses a definite sense of abandonment, and by its very nature, it will only become more and more pertinent with age. When links start breaking and decaying, the site will become one of the **"forgotten and deserted"** web pages Wein talks of. Wein's own portfolio page has not been updated for 4 years.[4.17] Has she become a victim of her own concerns? Or was this all part of her plan?

4.16
Wein, The Fleetingness of Bits — Fear of Information Loss

4.17
Wein, Melanie, Personal Portfolio Website, 2005 (http://tr.im/xqnU)

4.F
Rosetta Stone, courtesy of jj_mac (http://tr.im/xojh)

4.F

SECTION FIVE

EXTRACTING A BEAUTY FROM THE BLUE SCREEN OF DEATH

Embracing, encouraging and enforcing the glitch as a digital art form

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Wein is beginning to hint at the extraction of some sort of poetic beauty from decay in the digital world, in stark contrast to Sterling, who talks about physical decay in an entropic, poetical sense, something which he feels its digital equivalence certainly is not:

"When a piece of software decays, it doesn't degrade like a painting, slowly and nostalgically. When software fails it crashes; it means the Blue Screen of Death." [5.1]

Sterling's views seem overly pessimistic and there are many, myself included, who strive to extract a beauty from digital decay. There is an obvious question which asks what if digital data did decay in a more poetic sense. What if we were to embrace its binary charm? We do not expect a book to look the same when it is 100 years old as it did on the day it was made. We would not even want it to.

Someone who takes Wein's line of thinking to the extreme and has views at the very opposite end of the spectrum to Sterling's is Andrew Ohlmann.
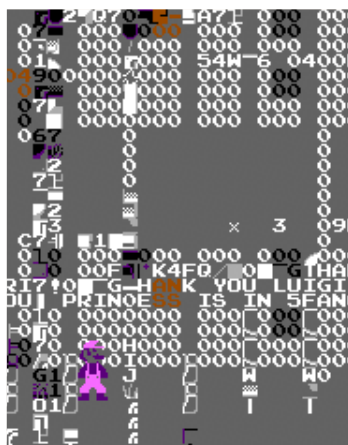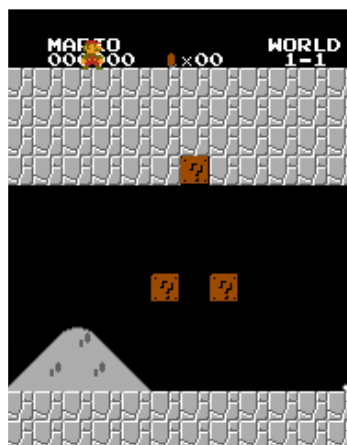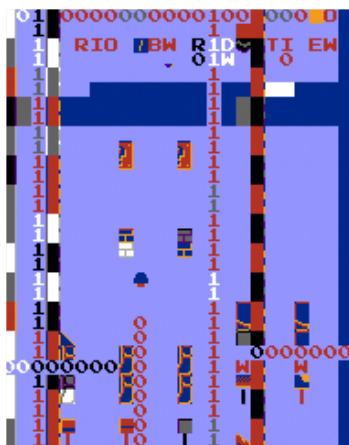
Ohlmann is a graphic designer who has been experimenting with 'glitching'. Glitching can be the undesired result of an error in a piece of software, but it can also exist in the form of somewhat controlled, enforced digital decay. Glitching in this respect is taking a piece of digital data, such as an image, video or audio clip, opening its HEX or ASCII source code in a text editing program, and actively decaying it in some fashion before re-saving the file and opening the result with the intended piece of software for the file type.

Ohlmann has done some fascinating work with old computer games, and in particular with Super Mario Brothers. His post, entitled The Eventual Decay of the Super Mario Brothers [5.2] on the intensely inspiring Space Collective looks into the glitching of the game. The game's source is tampered with, re-saved and ran through an emulator.

"The resulting images and experiences one gets from hacking Super Mario Brothers in such a fashion are glorious.

Colors shift at will, Mario walks through walls, music changes when you stomp on an enemy, the background turns into walls and walls of text. When you insert glitches into the game, you decay it in some fashion." [5.3]

A very different method that produces similar effects to glitching is 'circuit bending'. This could be considered the physical equivalence of decaying the code of a game. Here the actual hardware of the games console is tampered with, wires are moved, connections are purposefully short-circuited, etc. Visually the results are somewhat similar to with code glitching, however in the case of circuit bending, the decay becomes user-controllable in live-time, almost like another joy pad with which to operate the game, glitching at will. The beauty is that almost any electrical device can be circuit bent to an extent. From a Gameboy to a keyboard to a Furby.

5.1
Sterling, Digital Decay — page 21

5.2, 5.3
Ohlmann, Andrew, The Eventual Death of the Super Mario Brothers, 2007 (http://tr.im/xmeH)

5.A
The Glitch Dilemma, Self-Portrait, Rosa Menkman (http://tr.im/xolb)

5.B
Screenshots from **The Eventual Death of the Super Mario Brothers**

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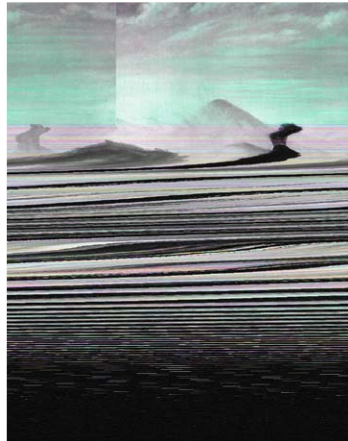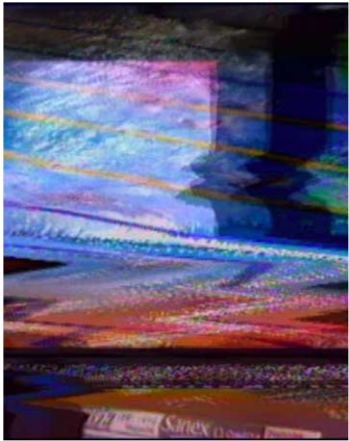
Gaming has always been a powerful metaphor for the real world, and for anyone of an architectural background, this glitching and circuit bending throws up some incredibly absorbing chains of thought. This is effectively de-generative design.

Mario being able to walk through walls is particularly pertinent, a simple alteration of a code can result in a surface being permeable, loosing all of its physical connotations and becoming a purely visual stimulus. Imagine a wall that is not actually there. The room is a desirable volume, we crave enclosed space, we feel sheltered, but could a surface be purely visual, open to adaptation, transformation and penetration? The idea of a space that is entirely transformable is not new, but the idea of the unpredictability and entropic nature of decay in this transformation is certainly little explored.

Another who adheres to a similar line of thinking to Ohlmann is Rosa Menkman, a Dutch visualist "who focuses on visual artifacts created by accidents in digital media. The visuals she makes are the result of glitches, compressions, feedback and noise. Although many people perceive these accidents as negative experiences, Rosa emphasizes their positive consequences". [5.4]

Menkman entirely embraces the glitch as an art form. Her interest lies in reducing digital media down to its very basic visual form, the pixel, and in decaying it in some fashion. Most of Menkman's work involves active destruction of digital data by the artist, and she does consider the difference between the Glitching that she creates intentionally, and that which we can never predict or prevent:

"How can we explain the glitch as an unexpected, abnormal mode of operandi, when the artists working process and more importantly, what the artist aimed for was abnormal in the first place? In other words, can an intended error be erroneous?" [5.5]

5.4
Menkman, Rosa, Sunshine in My Throat, 2009 (http://tr.im/xomA)

5.5
Menkman, The Glitch Dilemma, 2009 (http://tr.im/xomR)

5.C
Various work from **Menkman's Digital Artifacts** collection (http://tr.im/xomp)

5.D
Extraboy-Megatronika, Menkman (http://tr.im/xoni)

5
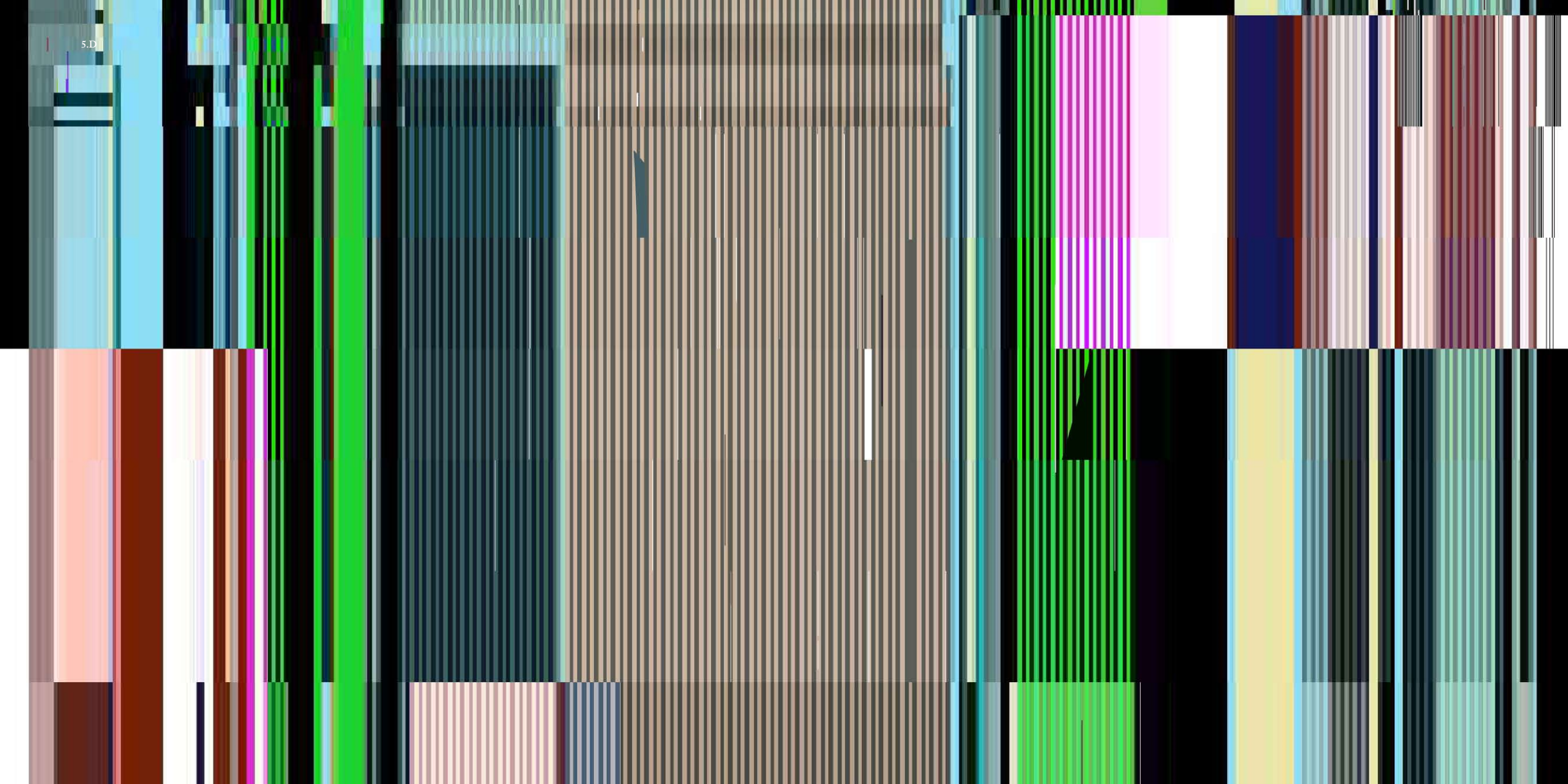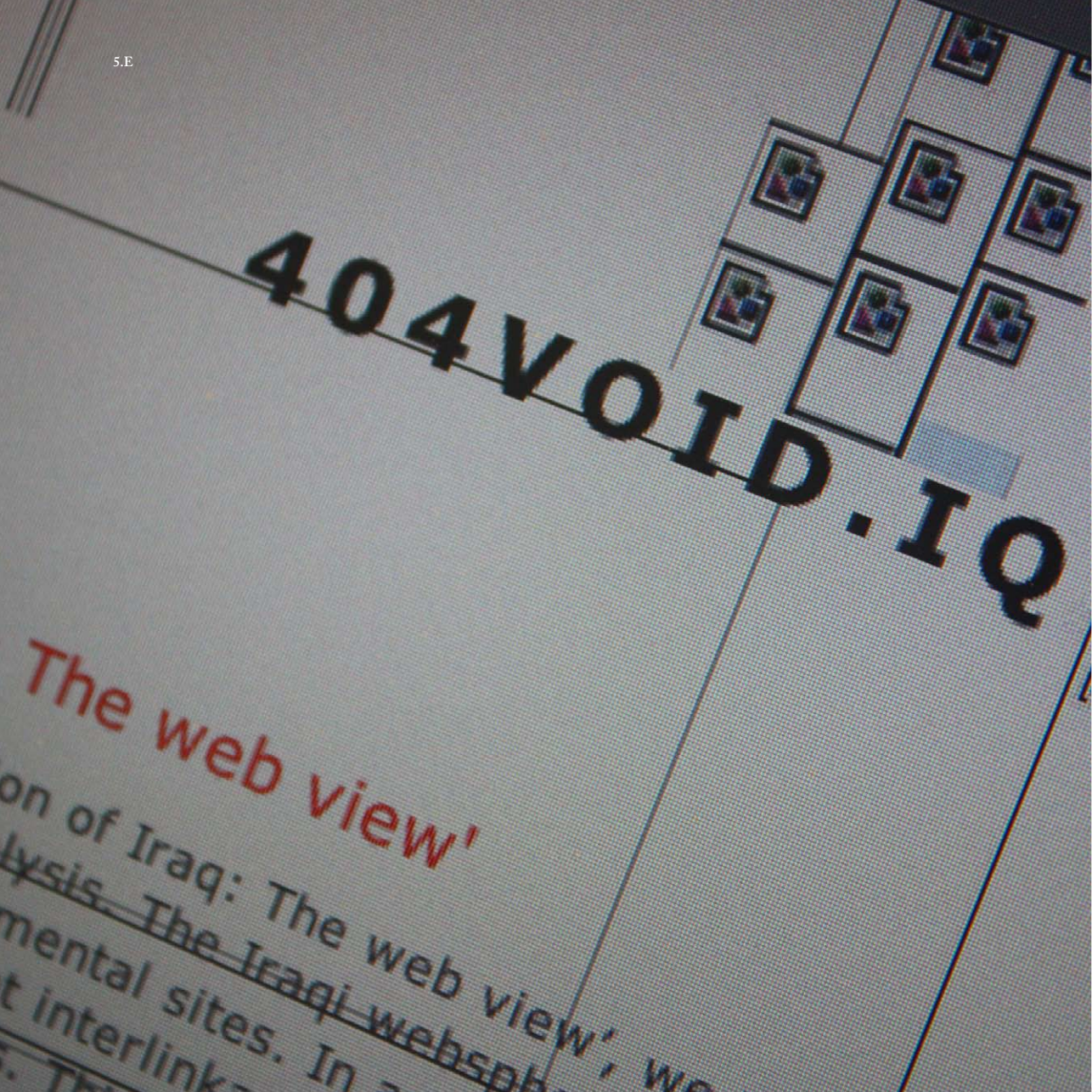
This poses an important question about digital decay. 'Rot', 'deteriorate', 'decompose' and 'fall into disrepair' are all words and phrases used to define 'decay'. All of them speak of a natural, entropic process of degradation over time.

Decay in the physical sense is not enforced intentionally, it is the side effect of use and time. Physical decay which is intentionally caused is more often referred to as damage. Is therefore the digital equivalence not actually 'digital decay' but 'digital damage', or does the digital realm, in its own, polar, binary existence, play by another set of rules?

Like Wein, Menkman shares an interest in the Internet and its capacity to decay. In her project 404VOID.IQ, [5.6] she looks at diagnosing the social state of Iraq in respect of the Internet. Under heavy monitoring and restrictions, the Internet in Iraq has developed abruptly. Mainly consisting of news, blogs, commercial and governments sites for many years, the lack of linkage between sites led to the development of many

isolated webspheres, something Menkman explores artistically in this project.

SECTION SIX
EXPLORING THE GLITCH

Experimentation with the digital decaying of image and video files through glitching

6

Experimentation began with glitching in its simplest form. A series of photographs of decaying surfaces in London's East end were opened in a simple text editing program, where their source code was randomly copied, pasted, deleted and shifted, before the image was re-saved and reopened.

Effects are initially rather subtle, sometimes barely noticeable, it is surprising just how much code an image is compiled from, and to achieve decent results a large portion of this must be altered. It quickly becomes apparent how the code of a JPEG image is the structure for each of its pixels. Copying a block of code and pasting it back further down the file sees a few rows of pixels shifted downwards in the image. The process requires much trial and error, often the image becomes broken altogether, rendering it unreadable, but the successful images are certainly interesting and rather poetic.

Image code is written in either the HEX or ASCII language, and there are specialist programs designed specifically for editing these.

6.B 6.C

6.D

6

Using a piece of software named HexEdit, the results were a lot more fruitful. It was soon discovered that each image file format had a unique code structure. With JPEGs, manipulation tends to be the vertical shifting of thin rows of pixels, whereas with TIFFs, effects are more commonly the shifting of large blocks of pixels in all directions. Each file format has a clear character, almost a willingness or a resistance to being glitched. This prompted some further research into the structure behind the source code of various image formats.

A JPEG is structured in a sequence of segments. Each of these segments contains a series of bytes, the first of which is a *'marker'* byte beginning with '0xFF', followed by a byte which indicates the type of marker. Often these two bytes are followed by a further two that indicate the length of the stored data which relates to the marker. For example, the bytes *'0xFFd8'* indicate the start of an image, and *'0xFFDA'* trigger a top-to-bottom scan of the image. Most commonly, the process of encoding a JPEG is done with *'JFIF'* encoding.

This is essentially the process of compression, which reduces the file size of the original image, and splits it into blocks of 8x8 pixels. [6.1]

A TIFF is also structured as a sequence of 8-bit bytes, however these bytes are numbered from 0 to N. A TIFF file begins with an Image File Header which points to an Image File Directory. The Image File Directory is where information about the image is stored, such as Meta data, and points to the actual image data. The Image File Header consists of two bytes that define the byte order to be used in the file. This can be either II (called little-endian, ordering bytes from least significant to most significant), or MM (called big-endian, ordering bytes from most significant to least significant). This is followed by the number 42 which fills the next two bytes and identifies the file as a TIFF, then the offset of the first Image File Directory which fills the final four bytes. The Image File Directory consists of a 2-byte value indicating the number of fields in the directory, followed by a sequence of 12 one-byte field entries, and a further 4 bytes which act as an offset for

6.1
Wikipedia, 2009
(http://tr.im/xqA3)

6.A
JPEG image glitched through code manipulation

6.B
JPEG source code

6.C
JPEG in the early stages of decay

6.D
Common error messages during the code manipulation process
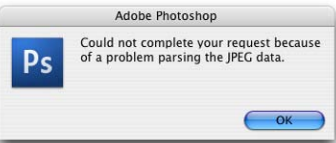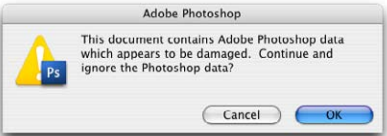
the next Image File Directory. The first 2 bytes of an Image File Directory is the tag that identifies the field and gives the TIFF its name (Tagged Image File Format). The 3rd and 4th bytes indicate the field type, the next 4 bytes indicate the number of values for the specified type, and the final 4 bytes act as the value offset which points to the next piece of data to be read in the image. [6.2]

Some of these contrasting properties in the structuring of JPEGs and TIFFs have been revealed during experimentation with image glitching. The nature of a JPEG's source code is modular and somewhat autonomous, it is divided into blocks of 8x8 bytes which display as a 64-pixel sub-image. These sub-images have no specified connection to each other, and therefore the manipulation of the code tends to have a rapidly destructive influence on the overall legibility of the image. As part of the JFIF encoding process of a JPEG, the colour profile of the original image is converted from RGB to yCbCr, where Y relates to the brightness of a pixel, and the Cb

and Cr components represent the red and blue chrominance. Variations in brightness are more perceivable to the human eye than variations in colour, and JPEG compression takes advantage of this fact. Much of the resulting code is given over to removing colours which show only a small difference in value between its neighbouring colour, and this is possibly why when manipulating this code we quickly see streaks of pixels who's hues have been shifted. Upon retrospective examination, these bands are 8 pixels in height, which further suggests that the 8x8 byte sub-images are arranged in horizontal rows, and that the tags containing the colour information is specific to each of those rows. JPEGs also use *'padding'* to recreate bytes which may have been removed during the compression process. This technique helps prevent the resulting image from being corrupt and unreadable and may explain why when shifting blocks of code during the glitching process there would appear grey pixels at the edges of the image. It was in fact true that the JPEG format was far sturdier than a TIFF, withstanding a far greater level of glitching.

6.2
Adobe Developers Association, TIFF Revision 6.0, 1992 (http://tr.im/xqAf)

6

A TIFF is organized as a rectangular array of pixels, the dimensions of which are stored in the file as ImageLength and ImageWidth. ImageLength defines the number of rows in the image, often described as scanlines, and ImageWidth specifies the number of columns in the image, the number of pixels per scanline. To increase editing flexibility, a TIFF is often further broken into strips, and a RowsPerStrip variable is given. This seems to thoroughly explain the nature with which a TIFF becomes decayed as its code is glitched.

In contrast to the JPEG, the TIFF retains much of its legibility as it is being decayed. Like a jigsaw which is being rearranged, one can still make out the component parts, although they may have been moved significantly from where they originally were. The strip system is most prominent in the examples shown. Since each byte contains an embedded link to the next byte, shifting a single byte results in the shifting of the rest of the bytes within that strip, resulting in thick bands of pixels retaining their structure.

The strip system may also be an explanation for why bands of pixels tend to loop around the image when the corresponding code is shifted. For example, adding a chunk of code before the start of a strip may result in that strip now beginning in the centre of the image, which would result in it also terminating in the centre of the image, on the next strip below. Pushing pixels across the image boundary results in their reappearance at the beginning of the strip immediately beneath.
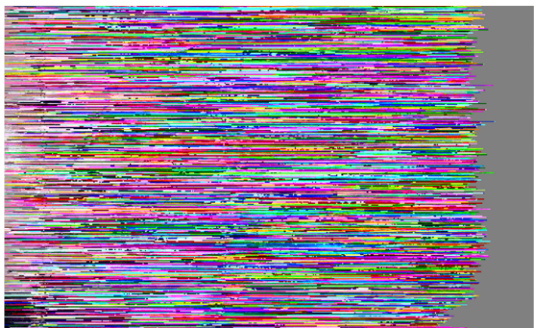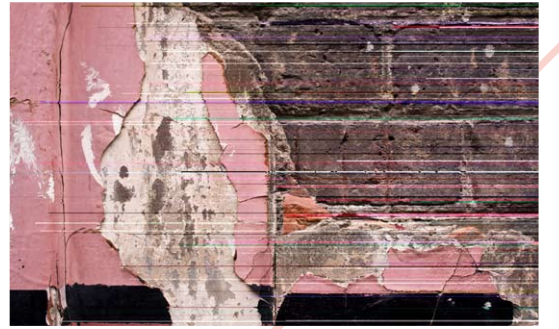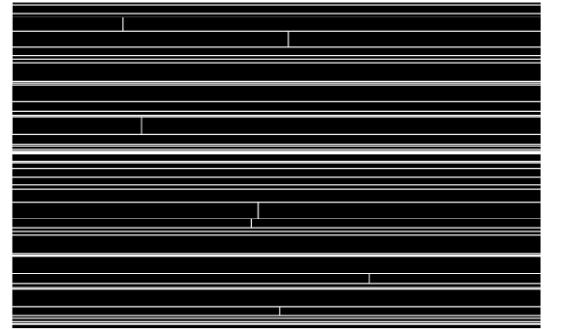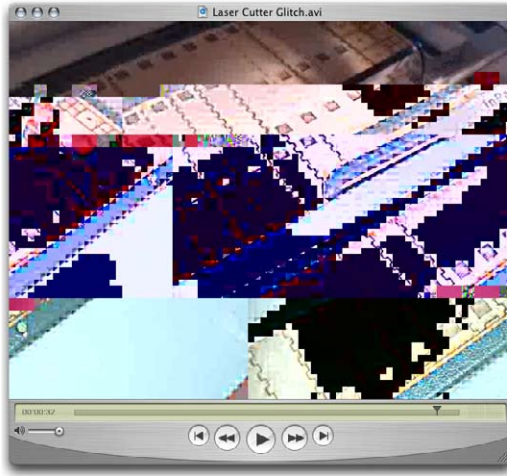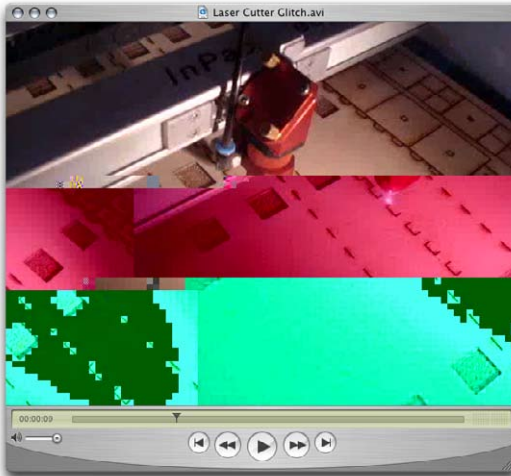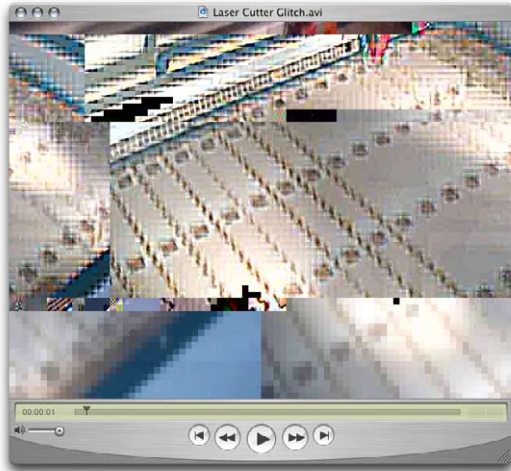
The stages of decay of a JPEG during progressive code manipulation. The code structure is clearly evident, and is highlighted by the adjacent diagram. (http://tr.im/xqAB)
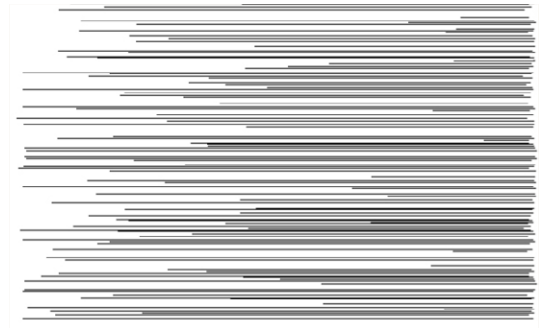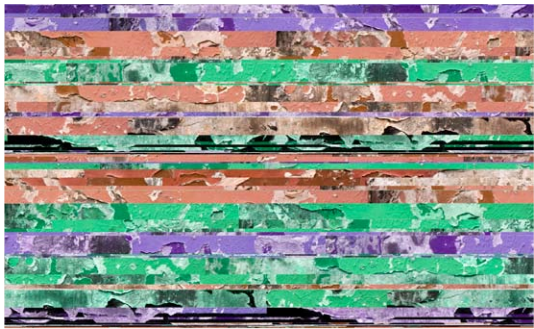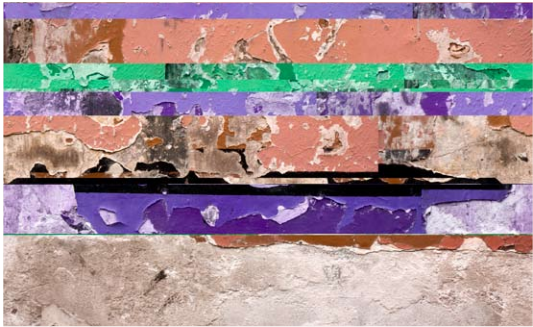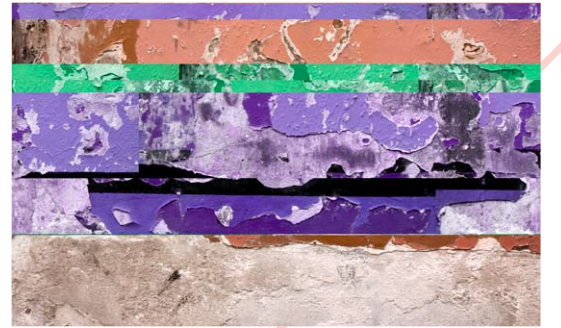
The stages of decay of a TIFF during progressive code manipulation. The code structure is clearly evident, and is highlighted by the adjacent diagram. (http://tr.im/xqAB)

Some brief experimentation was also done with video glitching, using the same technique of opening the source code, scrambling and re-saving, with some fairly interesting results, but again this was a process of trial and error which often resulted in the video being permanently destructed.

SECTION SEVEN
INTRODUCING AUTOMATION

Considering the implementation of an automated process for the decaying of digital data

All initial experimentation was done by hand, and it soon became obvious what sort of effects were going to occur from each manipulation. Taking influence from Menkman's line of thinking, there needed to be an introduction of further randomness into the process, and the obvious method of achieving this was through automation.

In its very basic form, the Find and Replace tool in most text editing programs can provide an amount of automation. Automatically replacing characters with other characters allows quick manipulation of individual pixels across a whole image, and results begin to get yet more interesting. Bands of pixels are now not only shifted positionally, but in terms of their hues.

Other methods of automating the process of decay proved to be unsuccessful, but it seemed imperative that the computer itself was what was enforcing the decay. This way, although the process would still be enforced, it would remain entropic, albeit digitally entropic, if such a concept exists.

All methods of creating an automated process of digital decay were surpassed, however, upon the discovery of a malfunctioning digital camera.

A friend was complaining about their camera scrambling the images it had taken, and upon inspection, slices of old images stored on the memory card were forcing their way into the most recently taken images. This unexplained glitching began when images taken of items of clothing to be sold on eBay began to penetrate architectural images taken on a day trip. The results soon developed into something more absorbing. The camera's owner, a teacher, had a series of photographs from her pupils' Christmas play stored on a memory card, and when she traveled abroad for a beach holiday, found that the images from the play were amalgamating into those taken on the beach. The camera, an electronic device, was almost displaying human qualities in its error, seemingly day-dreaming, mixing images in its lack of concentration as it reminisces. The results thrown up can be mesmerizing. In one case a snippet of a row of

young children sitting glumly in morning assembly is stretched across another scene of children playing in a dinghy in the sea. Viewers begin to take their own readings from the resultant montage, and although entirely subjective, this reading adds a level of captivating poetry to the image. Are the children in assembly sat bored, wishing to be playing in the sea? Many of the results are juxtapositions so strong that a human being could not have achieved the same impact from the same set of photographs. The machine is effectively decaying its digital memories, but in a way which is creative. One can extract undeniable similarities between this phenomenon and the human mind, and its tendency to fill in the gaps of a decaying memory through imagination, and even the blending together of very separate experiences into a single memory.

A digital image is the fusion of memory in the human sense and that in the digital. The photograph has become possibly the most powerful memory trigger in human beings, it portrays a human
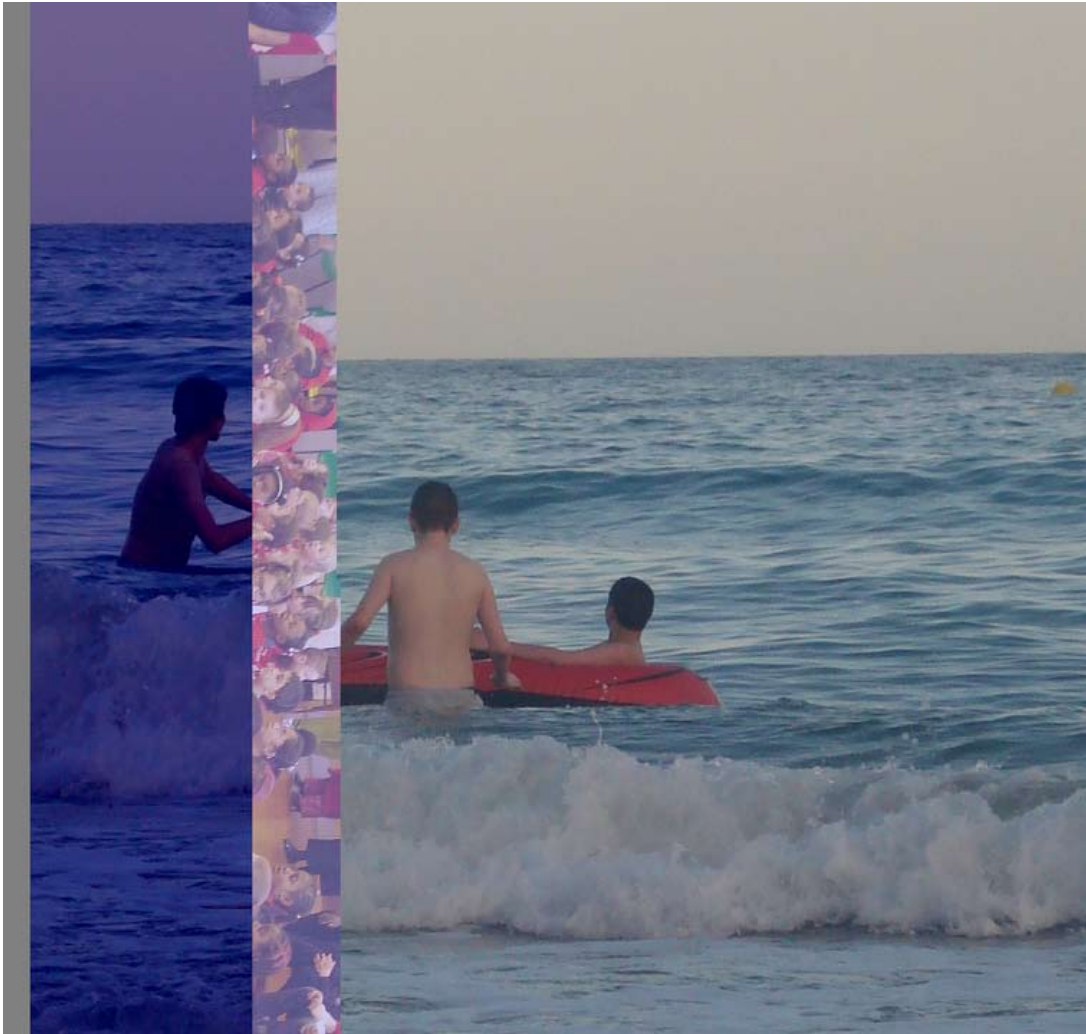
memory, but with the advent of digital cameras, it does so via digital means. A human memory is converted to a digital memory and stored on a hard drive. Sights, smells, tastes and emotions are converted to invisible bits and bytes and filed on a digital shelf, waiting to be reassembled at a later date.
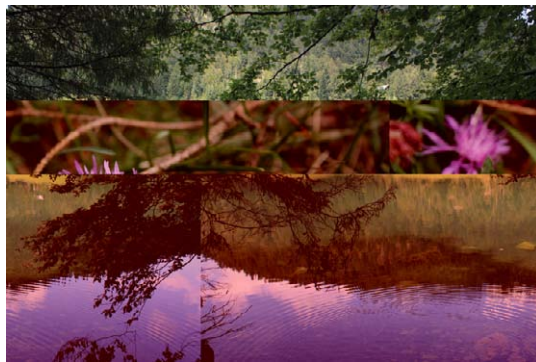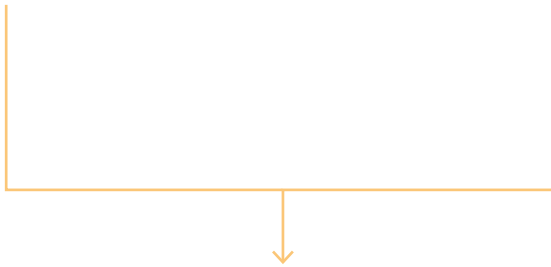
7.B

7.F

This discovery prompted further exploration of the glitching process with regard to the possibility of combining images.

If one were to open a pair of different images of the same file format, surely the two sets of code would be compatible. Copying and pasting code from one image to another should be like the copying and pasting of a paragraph of a story from one document to another. Given that both stories were written in the same language, the result would still be readable, although it would not necessarily make sense.

The theory proved to be correct, and it was in fact reasonably straightforward to manually create images similar to those created by the faulty camera. The difficulty of course, is that the entropic automation of the camera could simply not be replicated when creating the glitches manually. There is a certain character possessed by the camera glitches that cannot be achieved, regardless of how hard one tries. It may be something of a sub-conscious nature, but

knowing an image has been glitched by a machine certainly gives for a more interesting debate than any image glitched by a human.

7.G

SECTION EIGHT

# DESTROYING THE DIGITAL CITY

Decaying web pages via a series of online automated systems

Taking influence from Wein's captivating metaphor of the Internet as a dilapidated, decaying city, research was began into the possibility of decaying webpages.

GlitchMonkey[8.1] is a plug-in script for Firefox web browser which scrambles the images of a web page whilst the user is viewing it, and Glitch Browser[8.2] is a Google-esque site into which one pastes a URL which is then scrambled. Another site is CORRUPT™ [8.3], a project using Processing[8.4] to randomly manipulate the code of an image uploaded by a user, before saving a series of iterations onto its homepage. Each of these examples possesses an amount of automation, and one cannot help but wonder what would happen if they were used collectively. The first experiment was to attempt to have the Glitch Browser glitch itself by pasting into it its own URL.

"Computers are not allowed to make mistakes. The glitch browser represents a deliberate attempt to subvert the usual course of conformity and signal perfection. Information packets which are communicated with
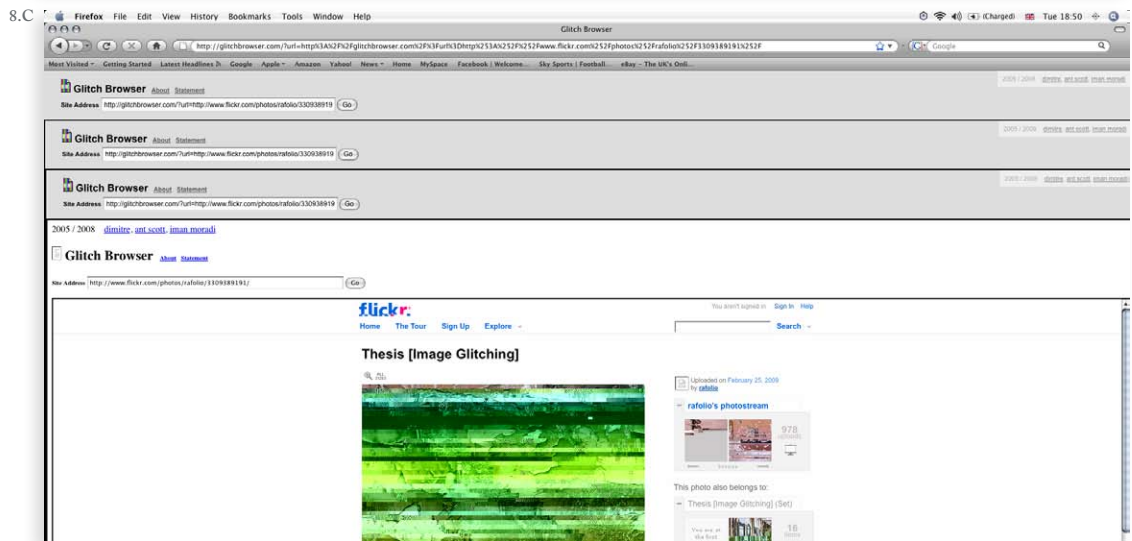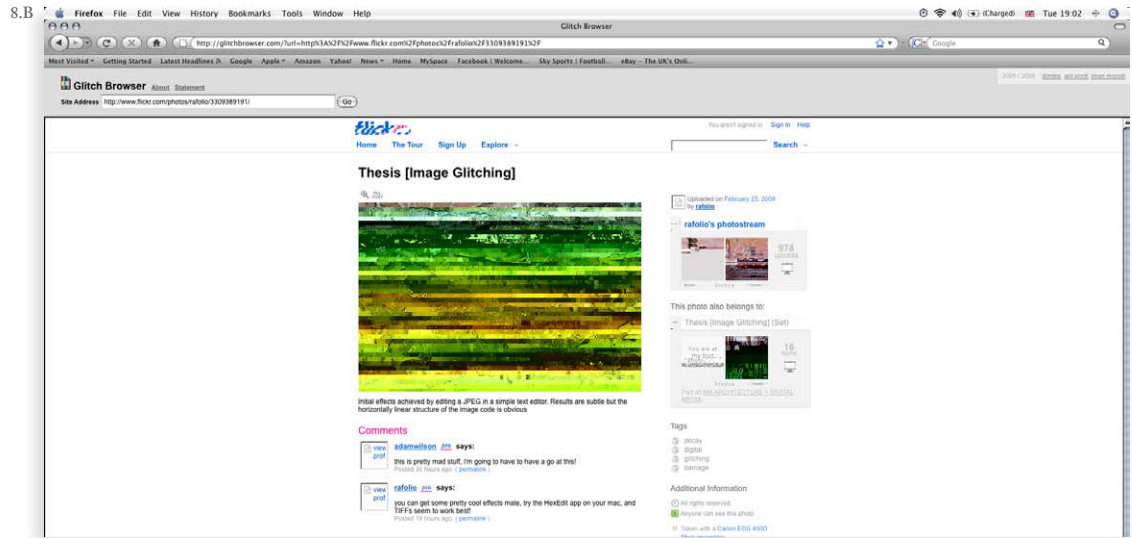
integrity are intentionally lost in transit or otherwise misplaced and rearranged. The consequences of such subversion are seen in the surprisingly beautiful readymade visual glitches provoked by the glitch browser and displayed through our forgiving and unsuspecting web browsers."[8.5]

Frustratingly, the Glitch Browser could glitch, but not be glitched itself. Each glitching generates a URL containing the decayed webpage, and the next experimentation was to paste this URL back into the Glitch Browser. The subsequent results were different to the originally glitched page, but not glitched to a higher degree. The process would glitch every image only once, in a random fashion.

Some increasingly complex experimentation was done with all three of the web-based glitching programs. The prospect of putting a web page through the Glitch Browser before taking a screen shot of the result and loading it into CORRUPT, all with the GlitchMonkey script running in the background was very exciting, but unfortunately

did not produce results of much interest. There seems a strange trait of glitching that once a piece of data is glitched, it is not an easy process to further glitch that data to a higher extent. This leaves one struggling to relate the slow, entropic, and progressive decay of the physical world into the digital realm, and hints at an aspect of truth in Sterling's thoughts.

**8.1**
GlitchMonkey Firefox Plug-In, 2008, created by youpy

8.2
Glitch Browser, 2005-2009 (Concluded), created by Dimitre Lima, Iman Moradi & Ant Scott

8.3
CORRUPT™, 2006, created by Benjamin Gaulon, aka RECYCLISM™

8.4
Processing, a programming language, open-source development environment, and online community first developed in 2001 by Ben Fry and Casey Reas. It operates as an electronic sketchbook for developing ideas in visual computing.

8.5
Excerpt from the **Glitch Browser** home page

8.A
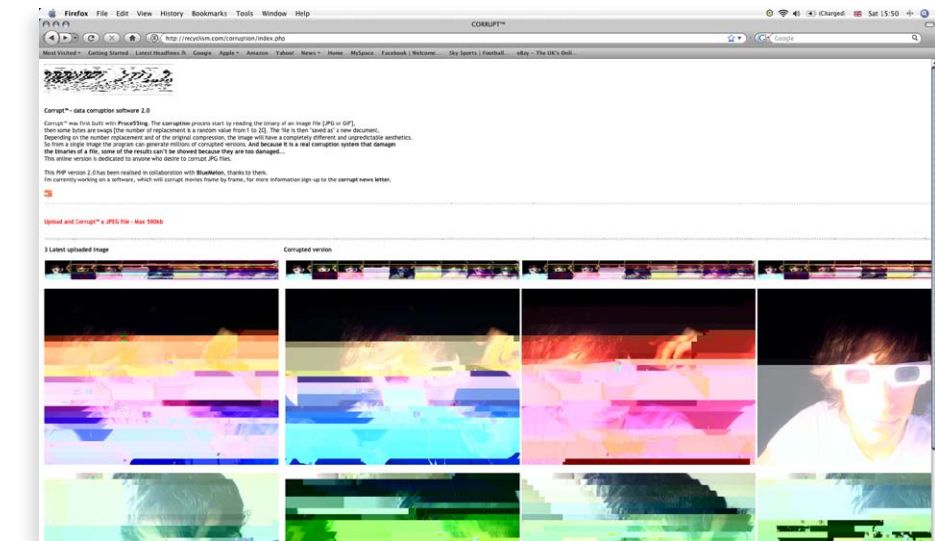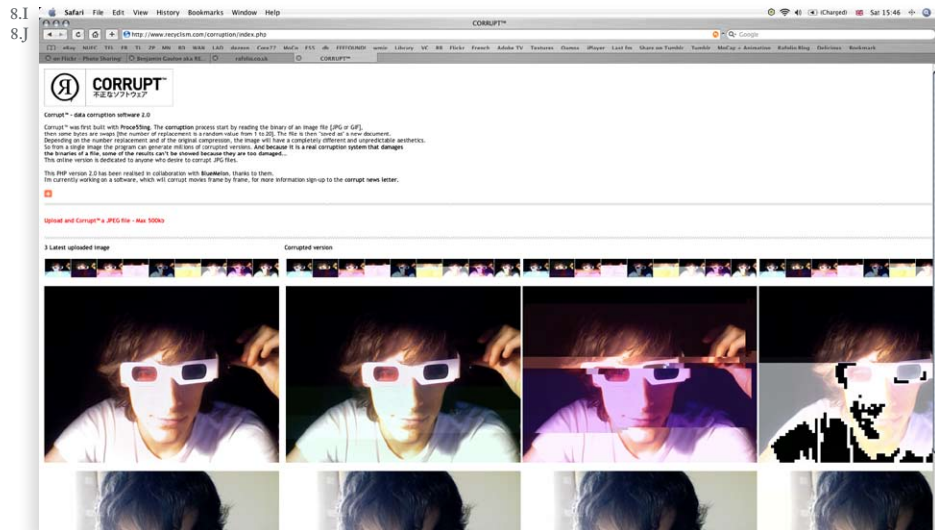Detail from a Flickr page ran through **Glitch Browser**
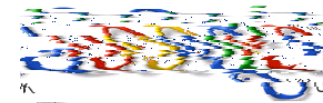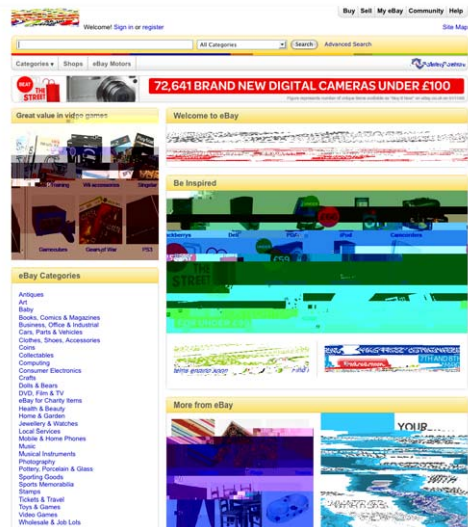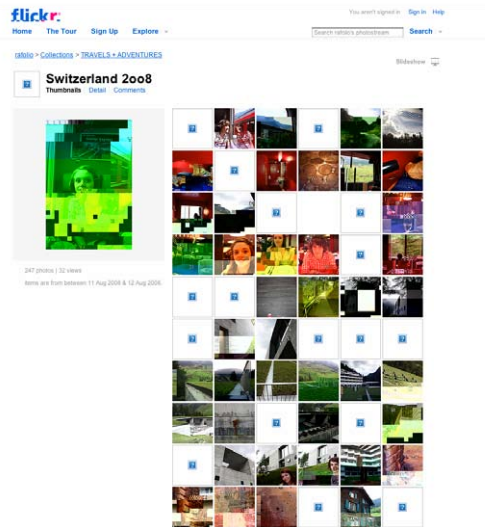
YEAH YOU'VE JUST BEEN GLITCH–MONKIED!

8.I
8.J

8.B, 8.D
Flickr page ran
through **Glitch
Browser**

8.C
Pasting URLs of
glitched pages back
into **Glitch Browser**

8.E
Ebay home page
with **GlitchMonkey**
script running

8.F
BBC home page
with **GlitchMonkey**
script running
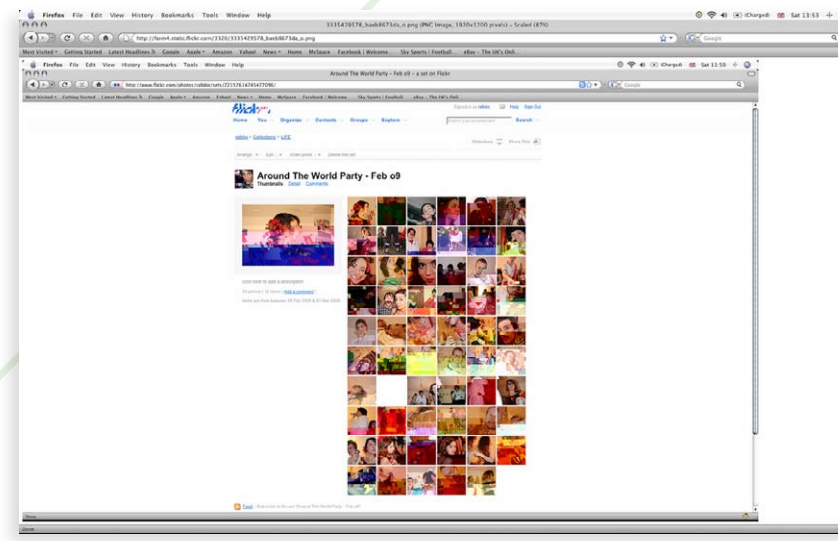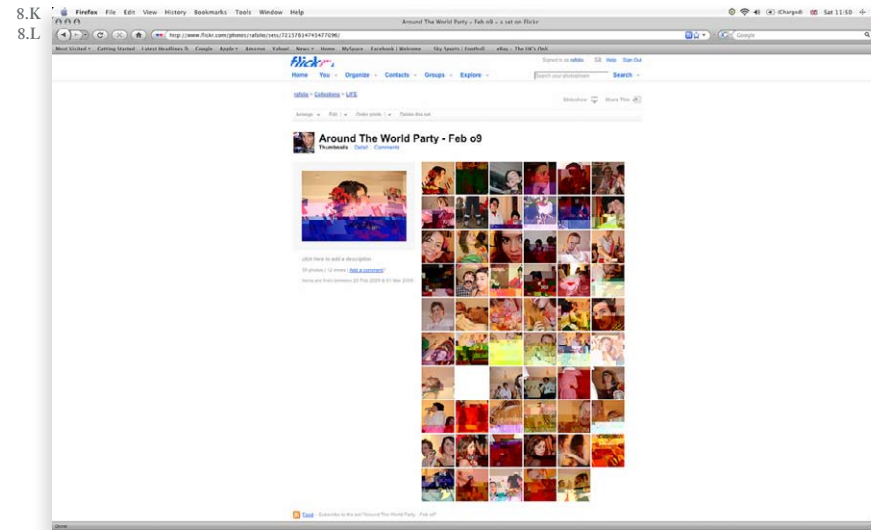
8.G
Webpage destroyed
via **Glitch Browser**

8.H
Google home page
with **GlitchMonkey**
script running

8.I
Image glitching via
CORRUPT™

8.J
Applying
GlitchMonkey to
CORRUPT™

8.K
Flickr page with
GlitchMonkey
running

8.L
8.K uploaded to
Flickr and resultant
page viewed with
**GlitchMonkey**
running

8.K
8.L

SECTION NINE
THE DATAMOSH

As a psychedelic vortex of melting pixels, datamoshing acts as a pertinent vehicle for the exploration of the boundaries between memory/decay in the human/physical sense and that in the digital sense

9

Possibly the most successful experimentation was done with *'Data Moshing'*. Data Moshing is the warping of videos and the blending together of scenes into a vibrant vortex of shifting psychedelic pixels.

It is made possible by the way in which videos are compressed. During the process of compression, each frame of the video is converted into either a *'P-frame'* or an *'I-frame'*. The I-frame is a record of the pure pixel data of a particular frame, the RGB value of each.[9.1] The P-frame records only the changes in pixels between itself and the previous frame. Normally, each cut scene in a video will generate a new I-frame, due to most of the pixels changing from the previous scene. The next frames, however, can be P-frames, as many of the pixels will be the same, only in different positions.
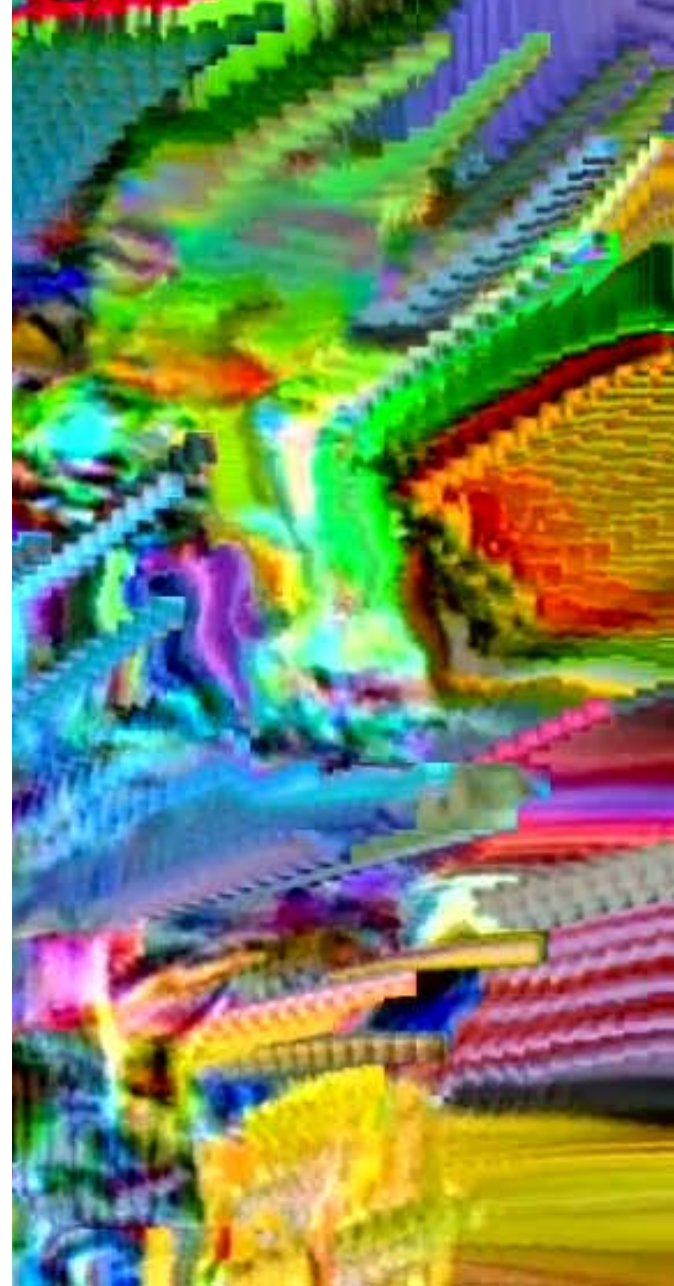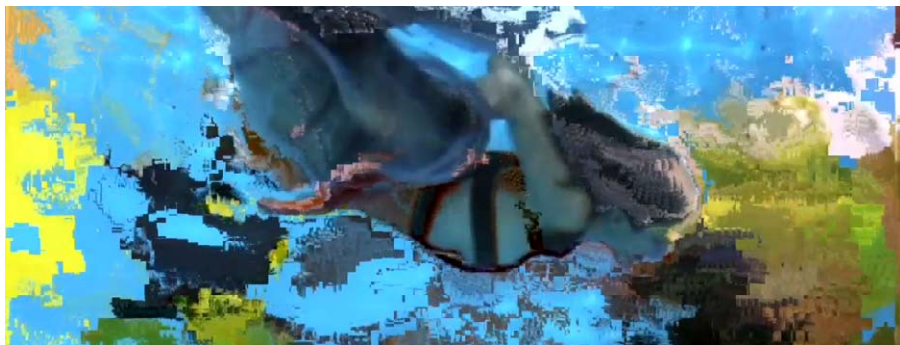
9

Using specialist software, the I-frames can be removed, resulting in the pixels from the final frame of one scene moving to the P-frame data of the next scene. The technique emerged as an art form fairly recently, and although it is difficult to pinpoint a specific inventor, Takeshi Murata is a key pioneer. In his work Monster Movie and Untitled (Pink Dot)[9.2], Murata uses 80's movies as moshing material.

Murata is often cited as a huge influence by those working with these sorts of techniques today, in particular Ray Tintori[9.3], who created possibly the most well-known example of Data Moshing currently to be found on the blogosphere. This piece is the video for band Chairlift's Evident Utensil[9.4]. The results Tintori has achieved are incredible. Shots of the band slowly melt into a streaked, colourful oblivion, only for them to suddenly tear through this trippy veil, dragging the pixels with their dancing movement.

9.1
Tintori, Ray, How to Datamosh, 2009 (http://tr.im/xlU8)

9.2
Murata, Takeshi, Monster Movie and Untitled (Pink Dot), 2005

9.3
Tintori, Ray, personal portfolio website (http://tr.im/xlWi)

9.4
Tintori, Ray, music video for band Chairlift, 2009 (http://tr.im/xlVV)

9.A, 9.C — 9.E
Stills from Chairlift music video, **Tintori**

9.B
Still from Monster Movie, **Murata**

9.F

9.G
9.H

9

Data Moshing has a unique and deeply interesting quality in its ability to randomly jolt across a timeline.

The pixels of one scene glide to the movement of the next, an incredibly poetic, gradually decaying form of digital memory is created. Any image can be dropped into the video as a still, and be grasped like a memory, a digital trace of a past event that is mashed into a playing video. Data Moshing certainly blurs the boundaries between both memory and decay in the human sense and that in the digital.

The major disadvantage of Data Moshing is the fact that it is predefined. After successful experimentation in moshing videos, the possibility of creating a real time system was explored, one in which a live feed from a camera could be moshed and projected, allowing people to have a direct influence over the process.
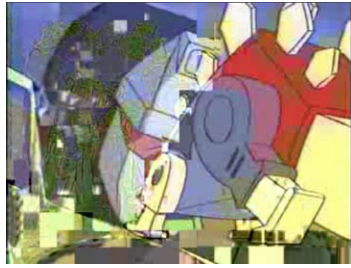
9.F

9.I
9.J

9.F — 9.H
Stills from Britian's Got Talent datamosh (http://tr.im/xpEq)

9.I, 9.J, 9.Q — 9.T
Stills from datamosh experimentation (http://tr.im/xpEL) (http://tr.im/xpEM)

9.K — 9.P
Stills from datamosh experimentation with **Transformers** cartoon clips (http://tr.im/xpFE)

9.K 9.L 9.M
9.N 9.O 9.P
9.Q 9.R 9.S


9.T

SECTION TEN

# MAXMSP / PROCESSING - INTRODUCING INTERACTIVITY

Using software to develop a real-time, automated system for the further exploration of memory and decay

10

Software such as Processing and MaxMSP[10.1] have been crucial in exploring the simulation of digital decay and digital memory as real-time, automated effects.

There are a vast array of open source patches and sketches available throughout the Internet community which can be downloaded and tweaked to achieve a desired effect through much trial and error. Processing initially looked to be a promising platform, and experimentation was done with digital slit-scanning. The technique takes a column of pixels from a camera and continuously feeds them into a band, over time creating a still image from thousands of snapshots of a real-time feed. Another useful effect is 'frame-differencing', which calculates the absolute difference between one frame and the next at any given moment.
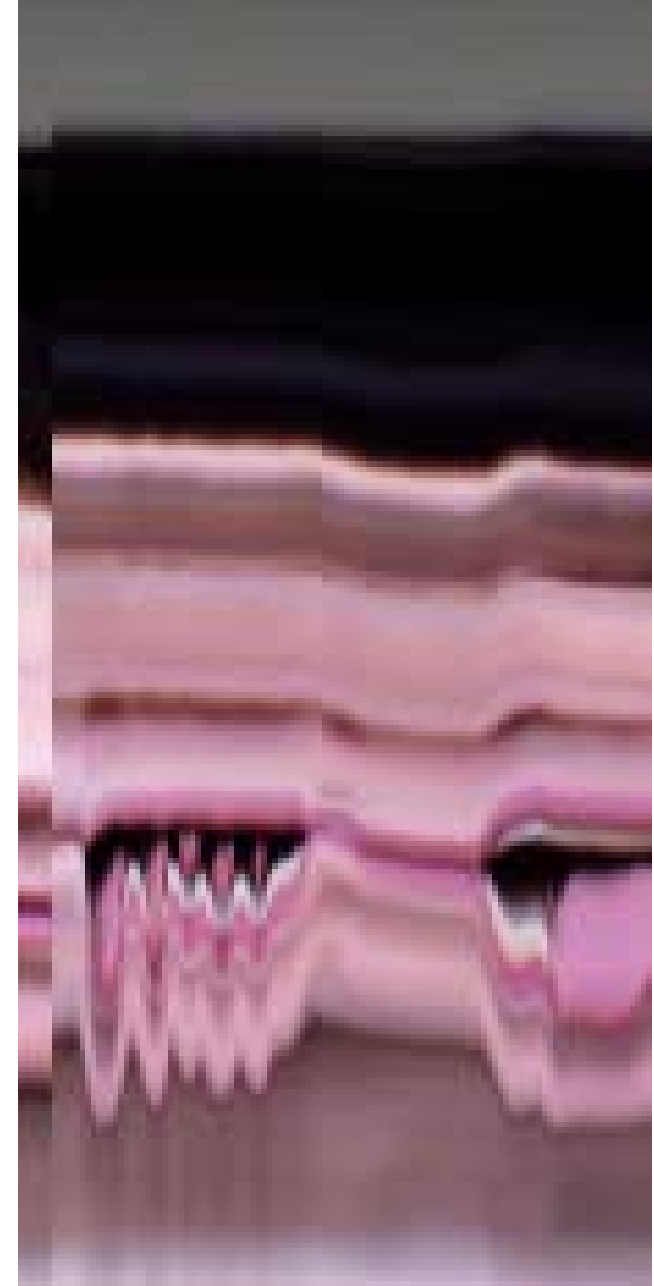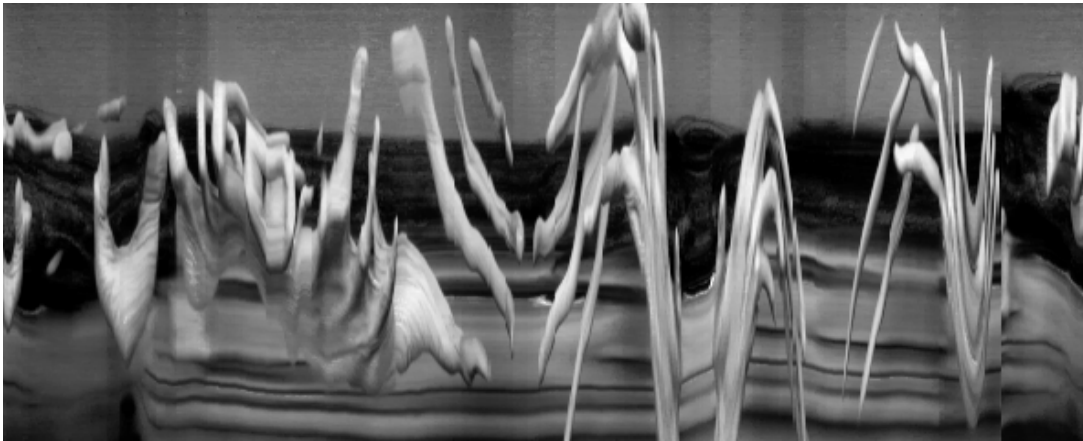
The OpenCV[10.2] library was used with Processing to apply this technique to a live camera feed. In one sketch (a Processing file is referred to as a 'sketch'), upon pressing a keyboard key, Processing would freeze the feed and overlay the resulting still image back over the live feed as a black mask. Any subsequent movement would then be displayed as the absolute difference between it and the frozen image. Through further refinement, namely converting the absolute difference to greyscale and applying a threshold filter to the results in real-time allowed a clearer view of the difference between frames. Each frame can then be stored as an overlay onto the live feed and have its opacity progressively reduced on the appearance of a new frame. The result is a visual trail of the previous states of whatever is being captured, acting as a memory of its movement.

10.1
MaxMSP is an interactive graphical programming environment for music, audio, and media, first developed in 1988 by Cycling '74 (http://tr.im/xlWZ)

10.2
Open CV is an open source computer vision library originally developed by Intel, latest version 2008 (http://tr.im/xlXb)

10.A — 10.C
Experimentation with **Slit-scanning** through **Processing** (http://tr.im/xqFO)

10.D
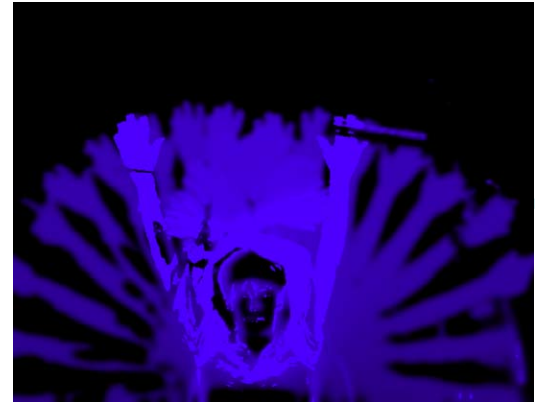
10.E 10.F
10.G 10.H

10

Although free, light and simple to use, the disadvantage of Processing is that it is a code-based application, meaning that it can be difficult to create custom sketches without prior coding knowledge. The advantage of MaxMSP is that it is a modular graphical development software which allows the creation of interactive environments via an intuitive, visual method.

An API allows third-party developers to create objects which can be pieced together to create custom patches. Jitter is the component of MaxMSP which deals with visual effects, and the Mean patch proved to be an interesting study of the relationship between digital and human memory. This patch calculates the mean matrix value of the pixels it records over time.

When applied to a camera feed the result is a gradually morphing blur of the captured movement. Another relevant patch was Debris, which distorts and decays the camera feed in real-time into blocks of glitched pixels, reminiscent of the data moshing effect.
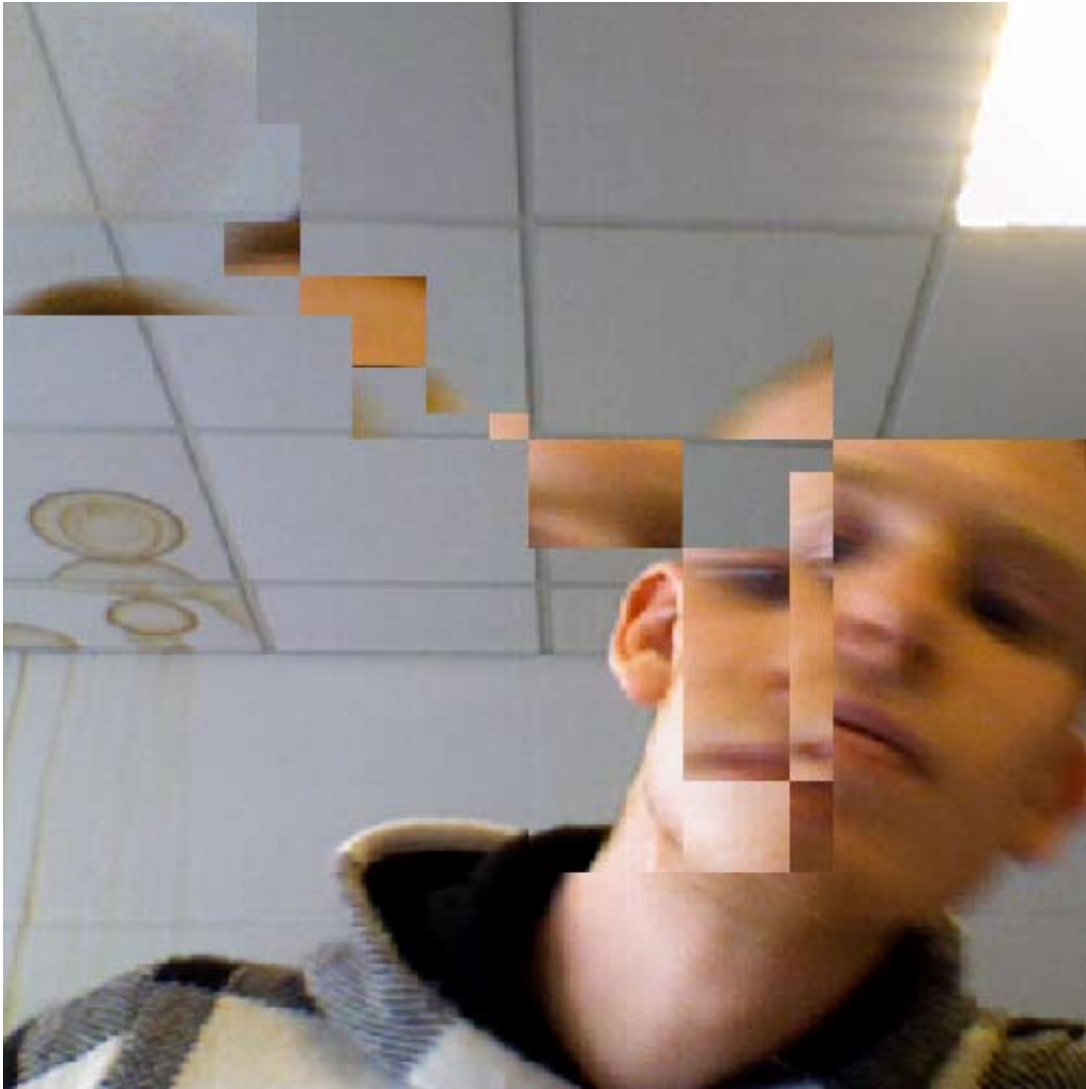
The beauty of MaxMSP is that it is simple to feed the outcome of one patch into another, and experimentation was done with mixing the Mean patch with the Debris patch. The results were disappointingly subtle, but in glimpses, hinted at something exciting.

10

A breakthrough was made upon the discovery of a patch named HSFlow[10.3] by media artist Andrew Benson which produced an effect very similar to data moshing, yet in real time. Much experimentation was done with the HSFlow patch, adjusting and adapting settings to achieve a range of destructive effects from the very subtle to the completely abstract.

10.3
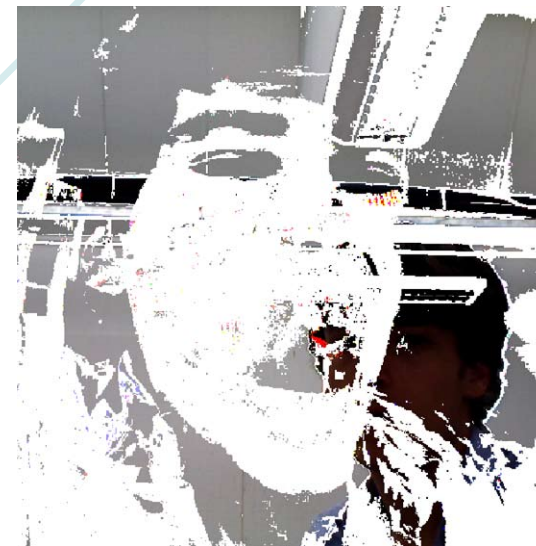**HSFlow patch,** 2009, by Andrew Benson, via Cycling '74 forums (http://tr.im/xaud)

10.L
Experimentation with the **Mean Patch** for **MaxMSP**

10.M — 10.O
Experimentation with **Andrew Benson's HSFlow patch** for **MaxMSP** (http://tr.im/xqG9)
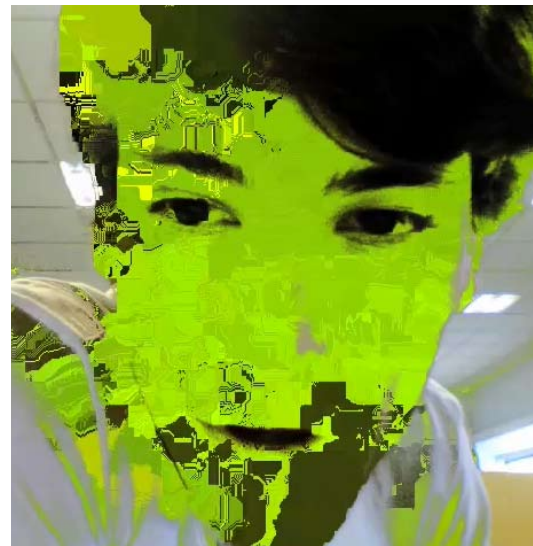
10.N

10.O

# SECTION ELEVEN
INSTALLATION

Research and experimentation culminated in an interactive installation which people were encouraged to visit and engage with

11 PROPOSAL AND REALISATION

The project manifests itself in a physical, interactive installation which explores digital memory and decay. The key aspects of the project - decay, memory and metaphor all speak of inclusion and humanity as much as they do of the digital realm. Memories bring people together, decay can pull them apart, and metaphor is the perfect tool for communication. The project needed something people could explore, visit and engage in.

The installation was held in a small, disused and somewhat derelict storage room within P3 Ambika[11.1], a huge events hall situated in the depths of Westminster University's labyrinthine basement. The room, L-shaped in plan, has a floor area of approximately 35m² and was chosen not only for its suitability for projection work, having no sources of natural light, but because of its materiality and atmosphere. Using a venue which possesses both memories for its users, past and present, and visible signs of wear, degradation and decay certainly adds a new
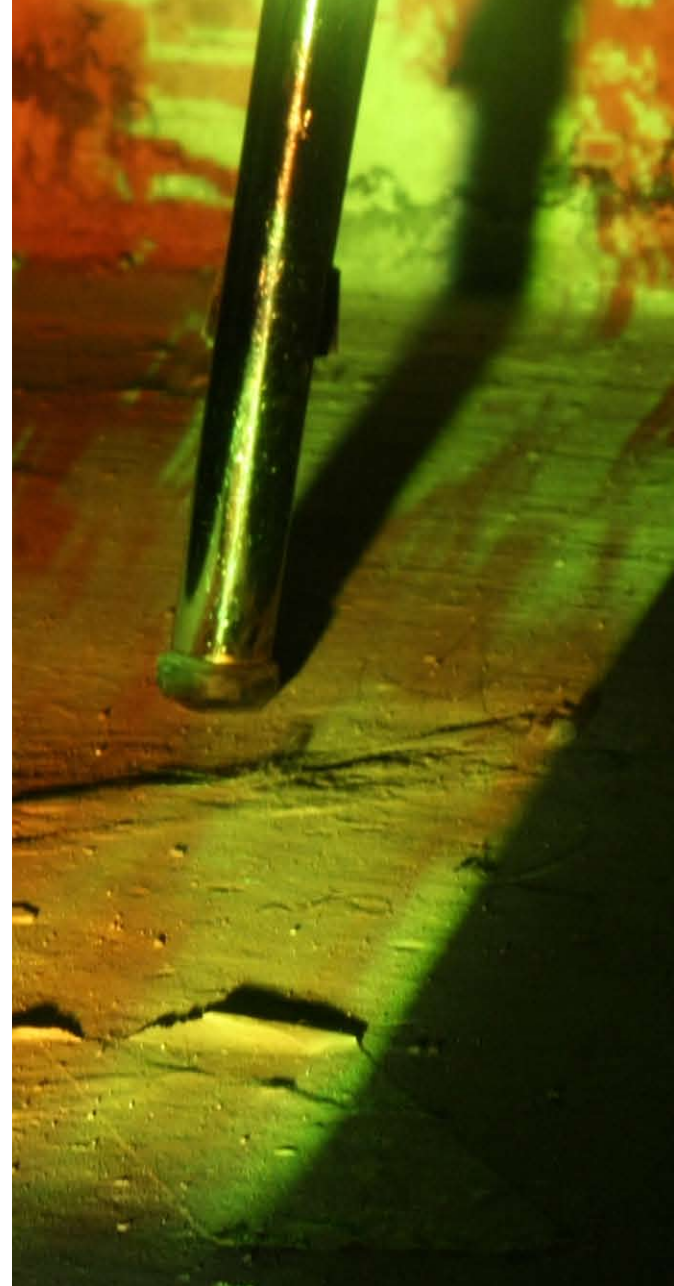
11

depth to the installation. If held in a gleaming, pristine white box, the installation would surely lose a degree of its poetry and its relevance to a particular site. P3 Ambika is the 14,000 sq ft former construction hall of the University's School of Engineering. Build in the 1960's, its dramatic scale led to its use as a testing centre for sections of the Channel Tunnel and Spaghetti Junction, and although now an exciting venue for artistic installations and exhibitions, it retains much of the paraphernalia of its industrial past.

The storage room was awash with patches of flaking paint, cracked concrete and damp plasterboard, and some initial experimentation was enjoyed with the projection of some of the early glitched images across the various surfaces. Essentially, digital decay was being projected onto physical decay, and what began as a simple exercise to calibrate the projection equipment resulted in the generation of some incredibly interesting results. Particularly pertinent were the instances in which it became almost impossible to decipher whether

one was viewing projected digital decay, or the physical decay of the surface which was being projected onto.

The installation itself consisted of a camera-projector live feed. The camera, fixed high above a suspended screen, sent a live feed of the space to the projector, which rear-projected the results onto the screen. Visitors were encouraged to visit the installation and saw themselves projected in real time. Over the course of the installation, this live feed was progressively decayed in a manner similar in appearance to the data moshing effect. Initial results were very subtle, certain colours within the feed becoming glitched. Soon the movement of visitors began to draw a trail of colour across the screen, before the projection eventually culminated in a surreal, psychedelic, blur of pixels which was almost unrecognizable from its initial stages. The visitor input becomes progressively abstract as the feed is decayed. What is initially a digital mirror becomes a canvas, an interactive piece of digital artwork of which the visitor simply manipulates the pixels.
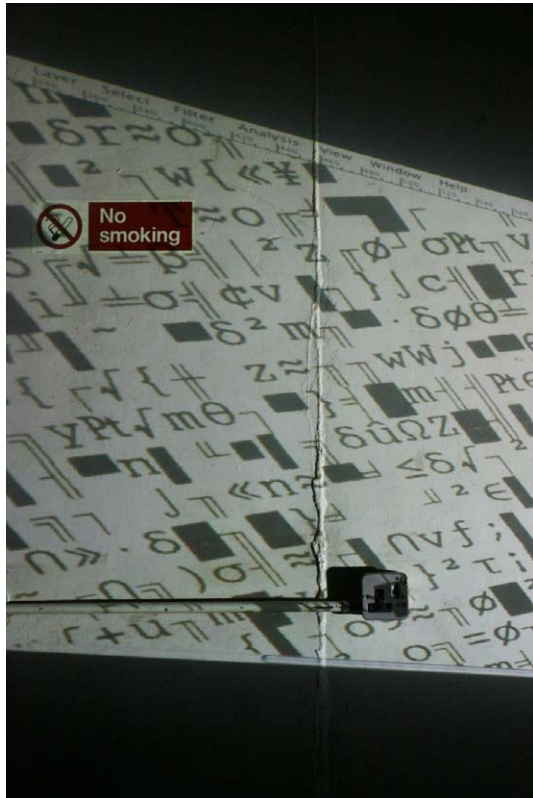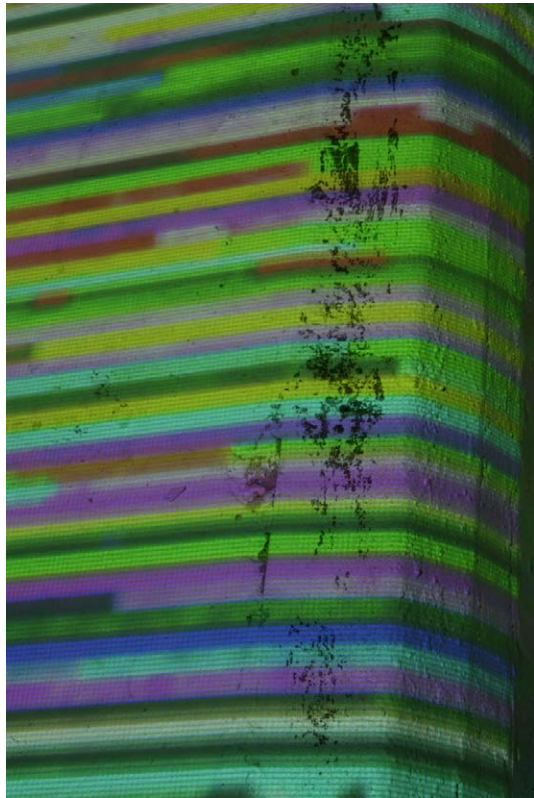
11.C 11.D

11

Upon entering the space, the visitor triggered a short recording. Their movements and actions were captured for 30 seconds and saved to a pool of videos. These videos were then recalled randomly throughout the duration of the installation and overlaid into the live feed at progressively more frequent intervals. Visitors began to share the space with its previous occupants, even with previous, lesser-decayed versions of themselves.

REAR PROJECTION ONTO SCREEN

WEB-CAM RECORDS SPACE WHEN TRIGGERED BY MOVEMENT

SHIELDED LAMPS PROVIDE SUITABLE LIGHTING LEVELS

SUSPENDED LINEN SHEET AS SCREEN, WEIGHTED AT BOTTOM

VARIOUS PROPS USED TO ENHANCE PROJECTION

VISITORS ENGAGE + INTERACT WITH INSTALLATION THROUGH MOVEMENT
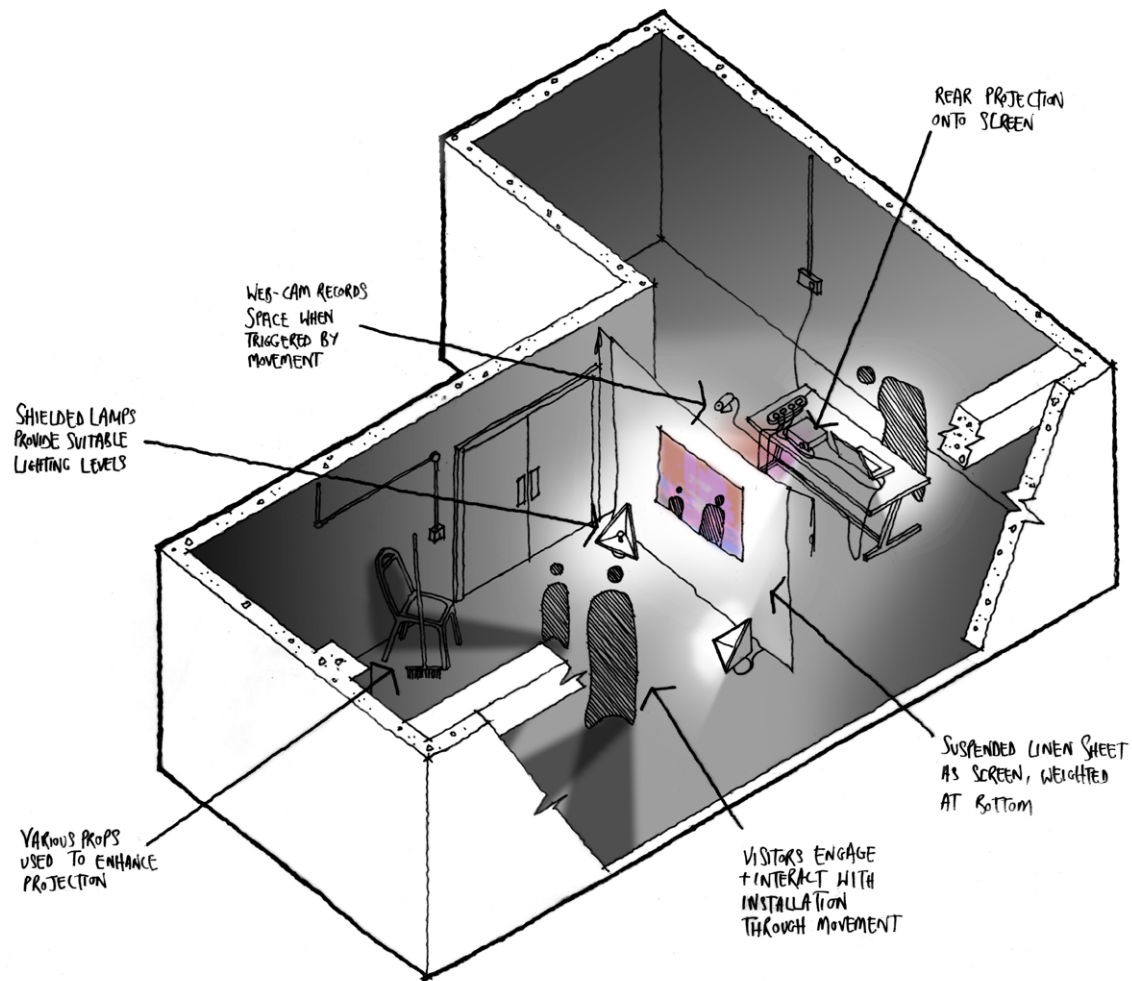
11

The installation remains part-proposal in that there is also an intention, given more time and resources, to incorporate the Internet into the system.

The proposal is that users may submit their memories of the site to the installation, via the Internet, in the form of images, video and audio files. Most likely these memories, digital in medium but human in origin, would come from a past time when the site was not in such a state of decay. This would further reinforce the relationship between the installation and the site in which it is located.

The submitted digital data would be decayed before being overlaid into the projection, in an automated process similar to Ted Davis' IMAGE_REMIX[11.2] project. A web page would act as a live stream onto which the decayed data would be stored, building up a log of these digital memories, giving the contributors the opportunity to view their decayed files. There would also be a second camera in the installation, positioned opposite the first, which would allow the Internet contributors t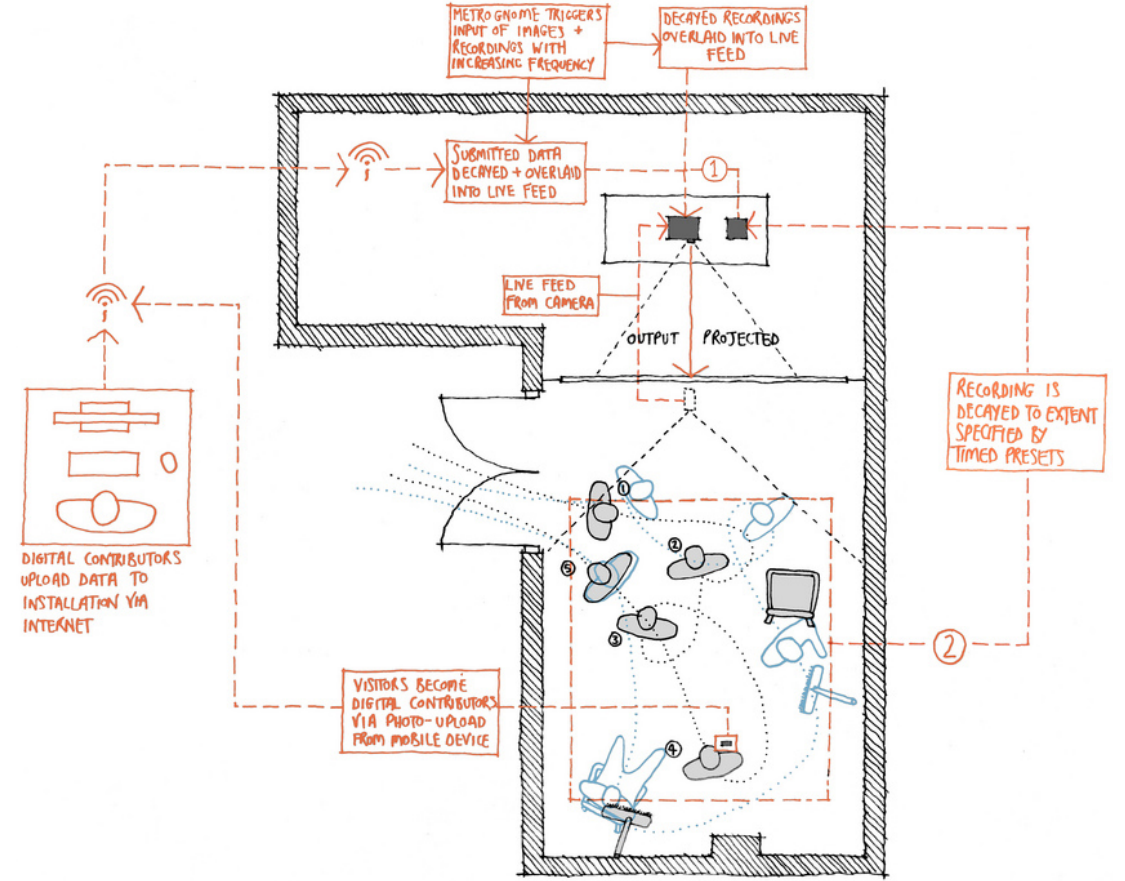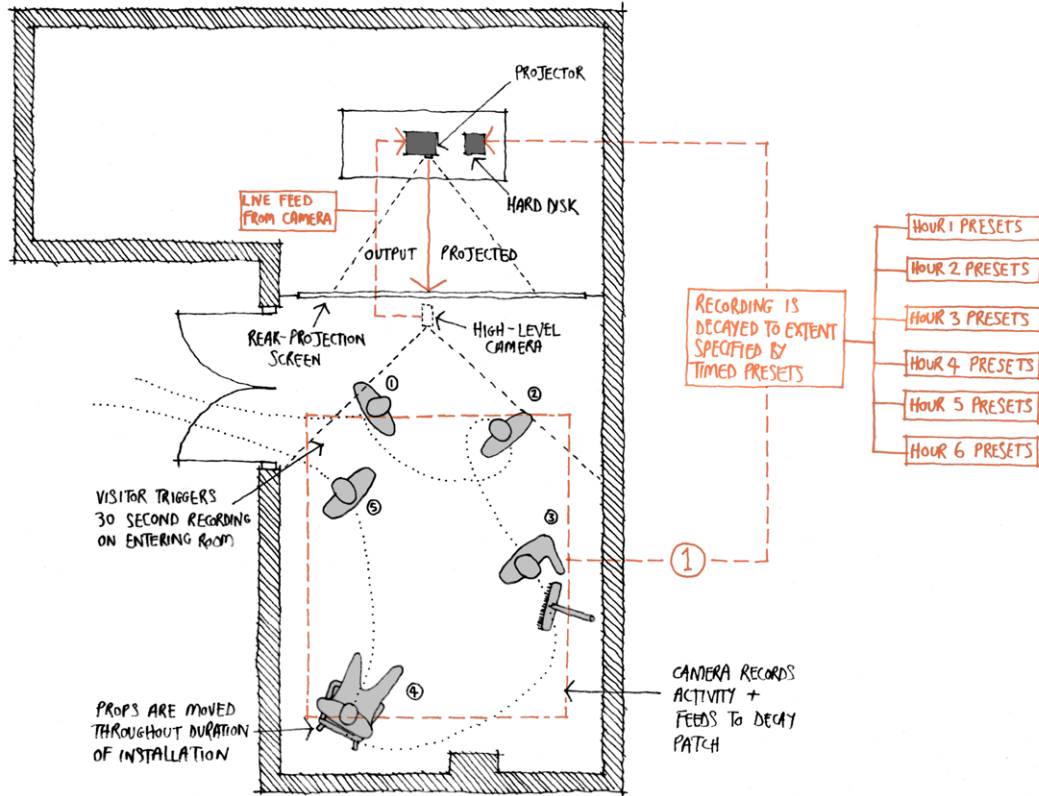o view the results of their input to the installation in real-time. There become two types of contributor, the physical (those who visit the installation) and the digital (those who supply digital material). Complex feedback loops begin to be generated, and with the web page acting as a hub for the transition of digital data back and forth, becoming progressively more decayed and glitched. A further level of complexity is likely to be introduced in the form of mobile Internet devices. Visitors who take photographs of the installation on their mobile phones could submit these to the same decaying feed as those who are submitting data via the Internet. The physical contributors become digital contributors.
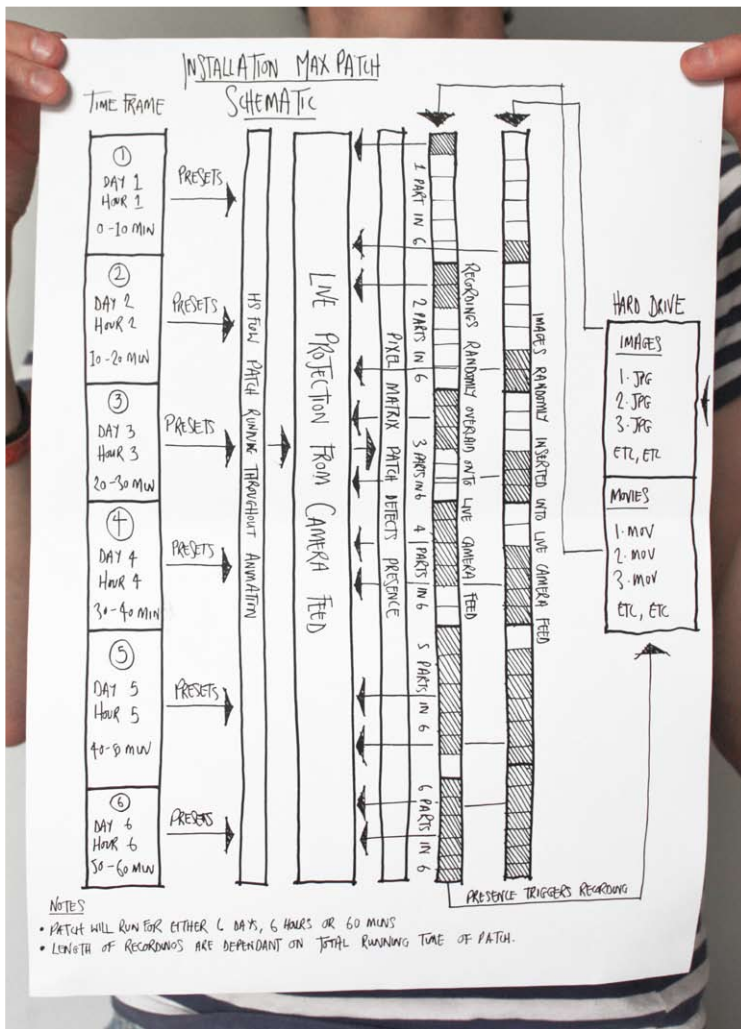
11.2
Davis, Ted, IMAGE_REMIX project, 2009 (http://tr.im/xlZ8)

11.F
Isometric diagram of installation (http://tr.im/xpYV)

11.G, 11.H
Plans explaining installation operation (http://tr.im/xpYV)

11

PROJECTOR

LIVE FEED
FROM CAMERA

OUTPUT   PROJECTED

HARD DISK

REAR-PROJECTION
SCREEN

HIGH-LEVEL
CAMERA

VISITOR TRIGGERS
30 SECOND RECORDING
ON ENTERING ROOM

PROPS ARE MOVED
THROUGHOUT DURATION
OF INSTALLATION

CAMERA RECORDS
ACTIVITY +
FEEDS TO DECAY
PATCH

RECORDING IS
DECAYED TO EXTENT
SPECIFIED BY
TIMED PRESETS

HOUR 1 PRESETS

HOUR 2 PRESETS

HOUR 3 PRESETS

HOUR 4 PRESETS

HOUR 5 PRESETS

HOUR 6 PRESETS

METRO GNOME TRIGGERS
INPUT OF IMAGES +
RECORDINGS WITH
INCREASING FREQUENCY

DECAYED RECORDINGS
OVERLAID INTO LIVE
FEED

SUBMITTED DATA
DECAYED + OVERLAID
INTO LIVE FEED

LIVE FEED
FROM CAMERA

OUTPUT   PROJECTED

DIGITAL CONTRIBUTORS
UPLOAD DATA TO
INSTALLATION VIA
INTERNET

VISITORS BECOME
DIGITAL CONTRIBUTORS
VIA PHOTO-UPLOAD
FROM MOBILE DEVICE

RECORDING IS
DECAYED TO EXTENT
SPECIFIED BY
TIMED PRESETS

11 RELEVANT TECHNOLOGIES

The technology behind the installation lies in MaxMSP/Jitter.

A clock patch is switched on at the beginning of the installation and is used to drive the other patches. Each run of the installation is broken down into six stages. The length of each stage may be altered to suit any time or environmental restrictions, and these stages are triggered by the clock. The patch which distorts the live feed is an adaptation of the HSFlow patch developed by media artist Andrew Benson. The patch essentially recreates the data moshing effect explored earlier, yet in real time, and is controlled by a series of presets which may be tweaked to achieve as subtle or as abstract an effect as desired. The clock triggers the application of these presets at the predetermined stages throughout the installation, gradually decaying the feed.

A pixel matrix patch is used to detect presence by taking a feed from the camera, and converting each pixel to either black or white. Upon a visitor entering the space, this pixel matrix is disturbed, and if more than a certain number of pixels, specified by a threshold value, are changed from white to black, a recording is triggered. The clock determines the length of the recording, and upon completion it is named automatically as part of a numerical series and stored on a hard drive.

These stored recordings are recalled at random and overlaid into the live feed with a frequency depending on the current stage number of the installation. During the sixth stage, a random recording will be recalled six times as often as during the first stage.
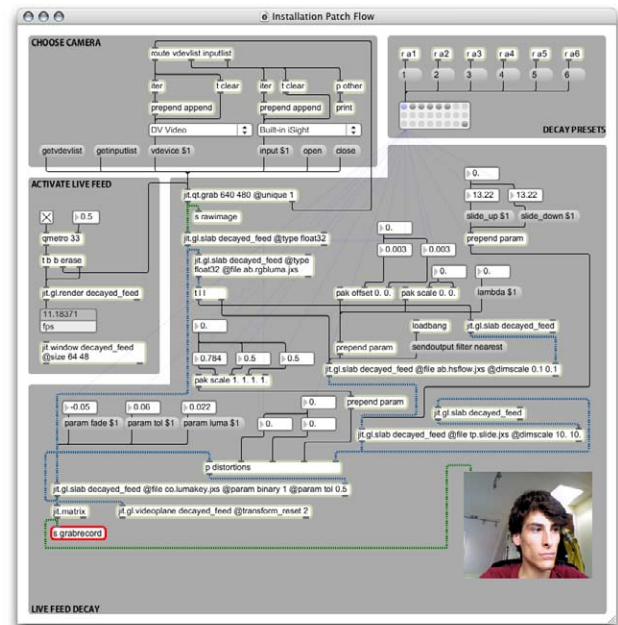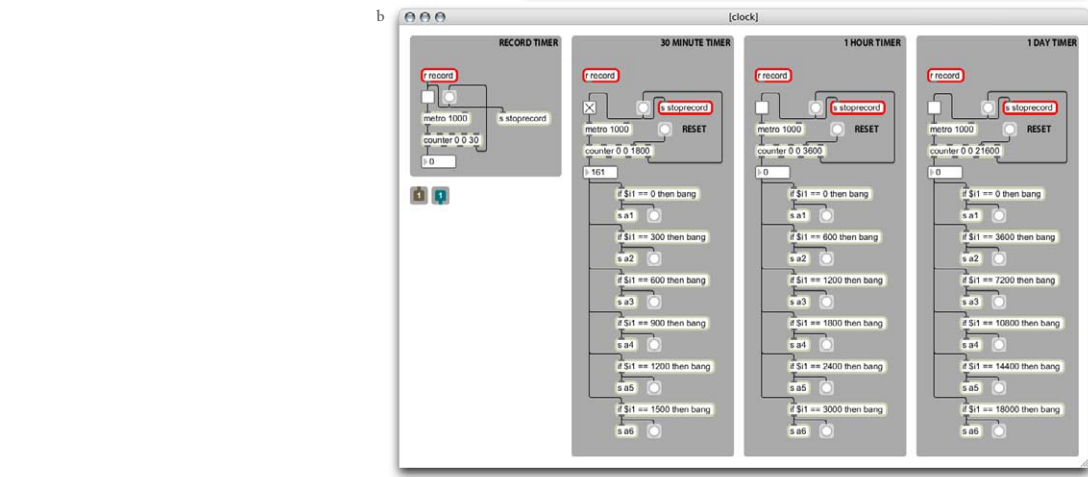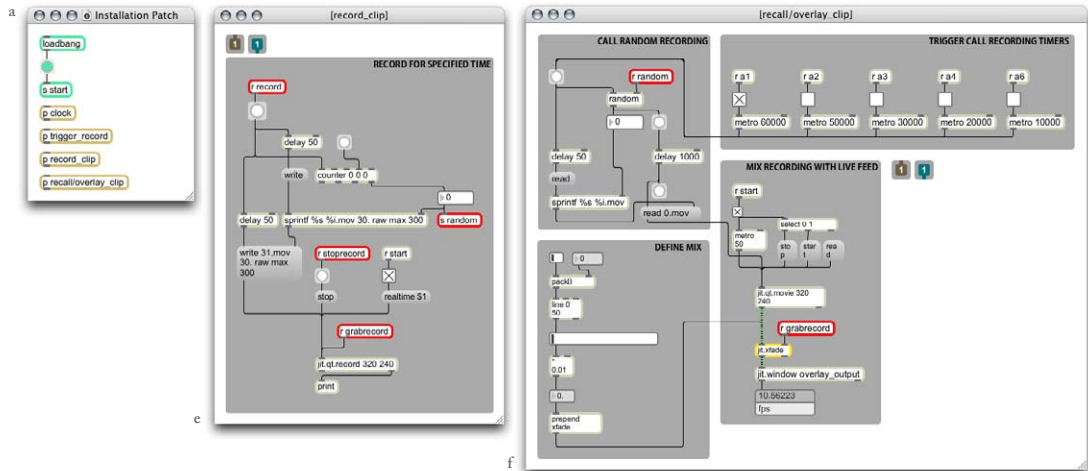
11.J
MaxMSP patch
developed for the
installation

a
This sub-patch is
used to trigger the
other sub-patches
upon opening

b
The clock sub-patch
drives the timing of
other sub-patches

c
This sub-patch
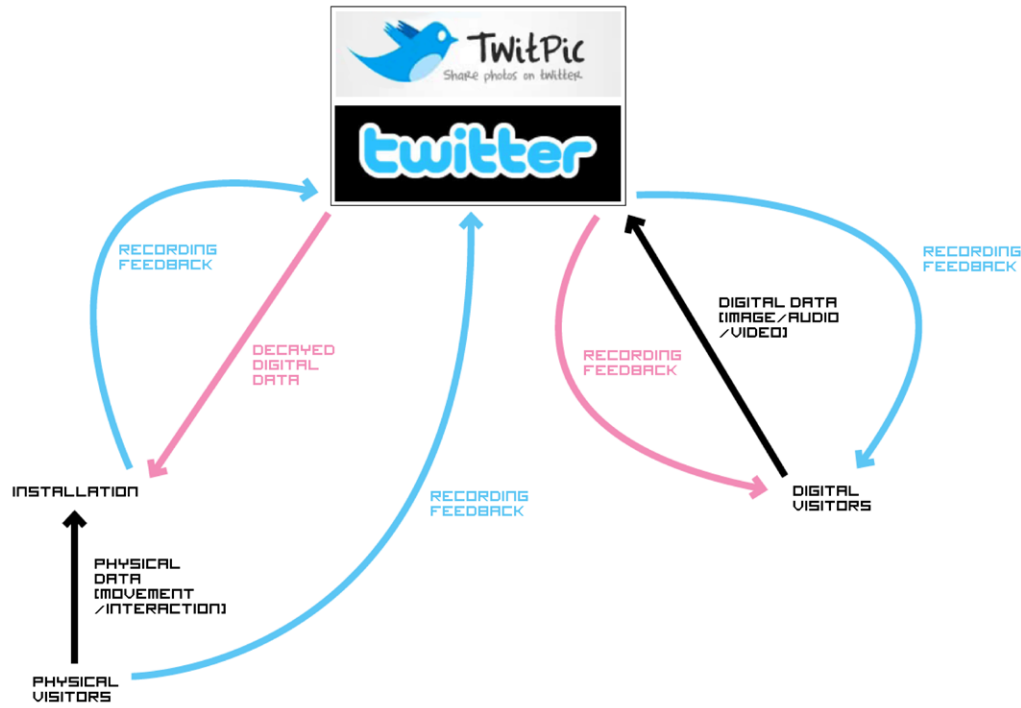applies the
distortion to the
camera feed

d
This sub-patch is
used to trigger a
recording upon a
visitor entering the
installation

e
This sub-patch
names and saves
triggered recordings

f
This sub-patch
recalls recordings
and overlays them
into the projection
feed

g
This window is the
output which is
projected

11.J

RECORDING
FEEDBACK

DECAYED
DIGITAL
DATA

RECORDING
FEEDBACK

DIGITAL DATA
[IMAGE/AUDIO
/VIDEO]

RECORDING
FEEDBACK

RECORDING
FEEDBACK

INSTALLATION

DIGITAL
VISITORS

PHYSICAL
DATA
[MOVEMENT
/INTERACTION]

PHYSICAL
VISITORS

11

The proposal component of the installation, the internet integration, would likely be achieved through a popular social networking site like Twitter[11.3], which has an accessible API allowing the third party development of systems allowing alternative uses of 'Tweeted'[11.4] data.

Users would be able to Tweet images via plug-ins such as Twitpic[11.5] and Flickr[11.6] to a Twitter feed. The user would tag their Tweet so that it is picked up by the system and decayed before being fed back to the Twitpic/Flickr page and to the original Twitter user. The decaying process would be fully automated, again using a MaxMSP/Jitter patch to destructively edit the source code of an image before re-saving it and passing it back to Twitter. The installation MaxMSP/Jitter patch would be adapted to source the images posted onto the Twitpic/Flickr page and save them to the pool containing the recordings taken from the space. In a similar way to the recordings, these images would in turn be called randomly and overlaid into the projection feed. A second camera would

record the space from another perspective and send a live feed back to the Internet, allowing users to view their input to the installation in real time.

11.3
Twitter is a Social networking and microblogging service utilising instant messaging, SMS or a web interface, founded in 2006 by Jack Dorsey (http://tr.im/xlZV)

11.4
A 'Tweet' is a message or status update by a Twitter user, limited to 140 characters

11.5
Twitpic is a utility allowing users to post images to their Twitter accounts from a mobile phone or an API, developed in 2008 by Noah Everett (http://twitpic.com)

11.6
Flickr is an image and video hosting website, web services suite, and online community platform created by Ludicorp and launched in 2004 (http://flickr.com)

11.K
Diagram explaining feedback and interaction loops

11

FUBA_RECORDER is a notable precedent that further describes the proposal. Claiming to be a "robot for generating abstract images of Japanese TV programs", FUBA_RECORDER blends together a series of screenshots from TV programs requested by its followers into beautifully glitched artwork, before posting the results to a Flickr feed. The sheer volume of outputted images leads one to assume that there is a process of automation occurring with FUBA_RECORDER, and the thought of a robot scouring the Internet for clips of TV presenters requested by its commander is both captivating and poetic.[11.7]
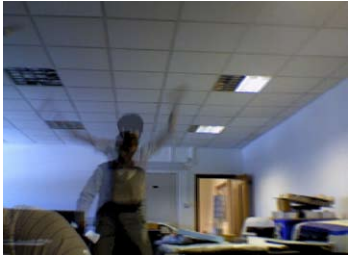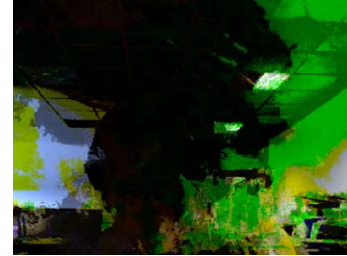
11.7
fuba_recorder, 2009
(http://tr.im/xm66)
(http://tr.im/xm6i)

11.L
Visualisation of mobile device being used to contribute to installation

11.M, 11.N
From **fuba_recorder**
Flickr stream

Screenshots from the one-hour-long version of the installation (http://tr.im/xqHt) (http://tr.im/xqHs)

Screenshots from the one-hour-long
version of the installation

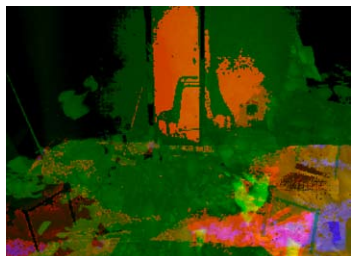Screenshots from the one-day-long version of the installation, 1st run (http://tr.im/xqHC)
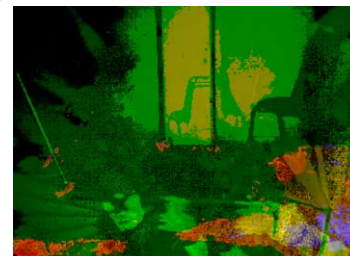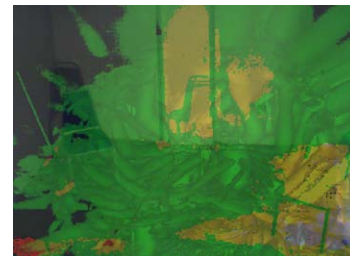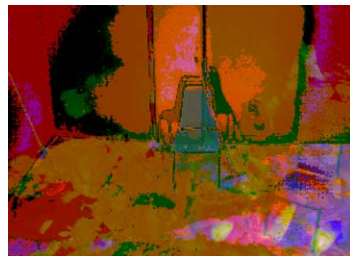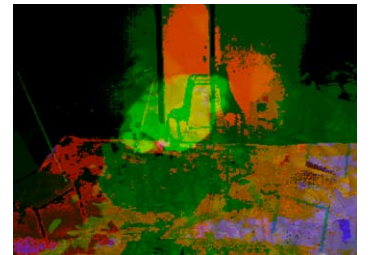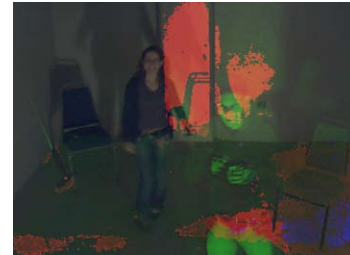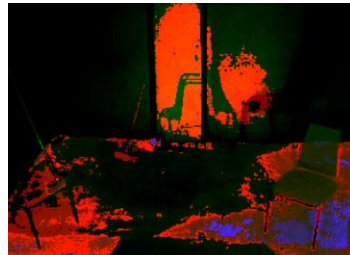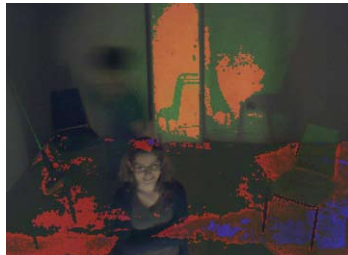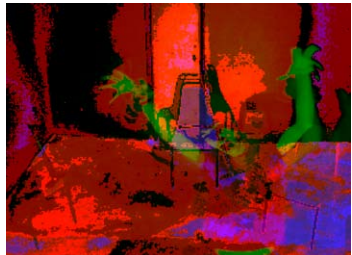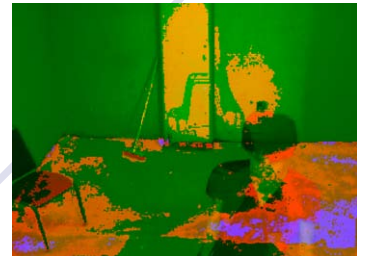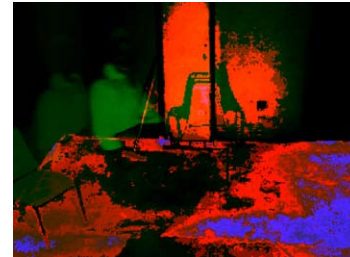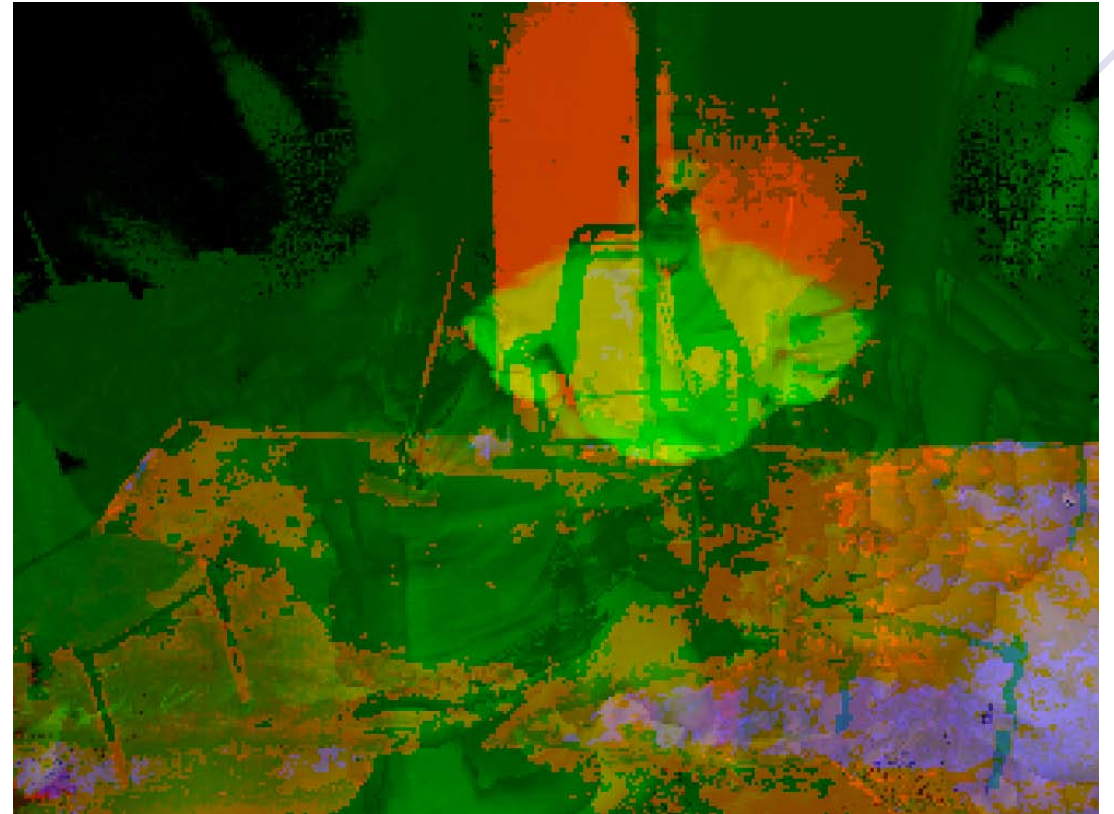
Screenshots from the one-day-long
version of the installation, 2nd run
(http://tr.im/xqHF)
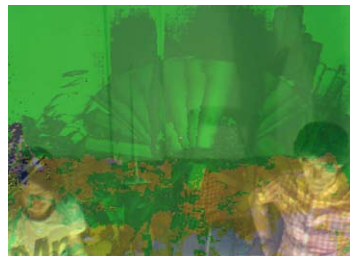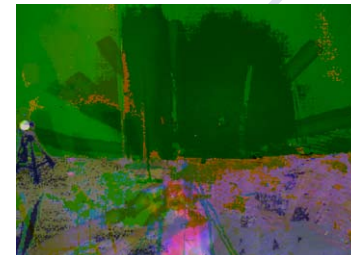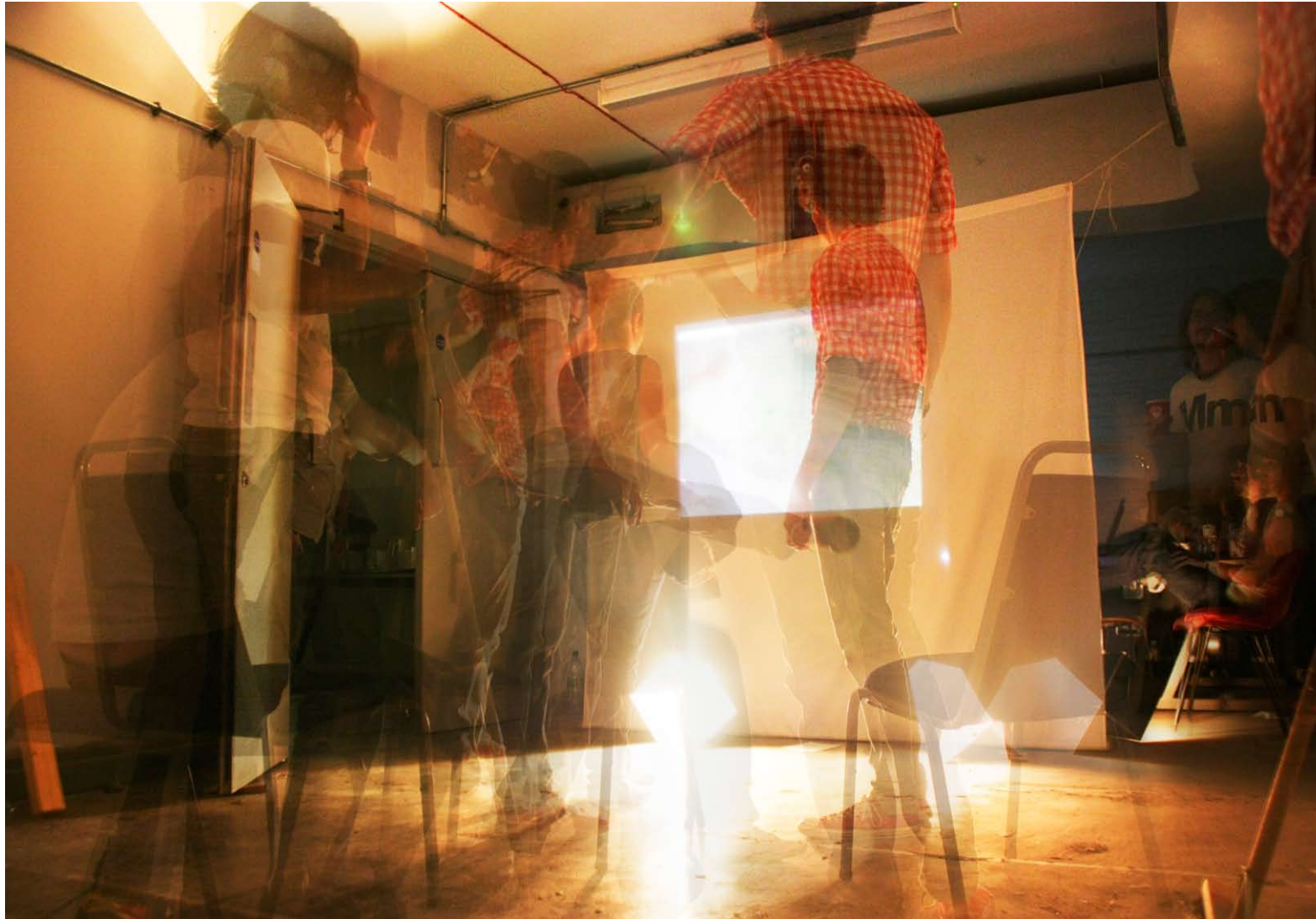
11

INSTALLATION REVIEW

The installation proved an invaluable exploration of the thesis topic, exploring the metaphors of decay and memory and attempting to blur the boundaries between their definitions in the physical sense and the digital sense.

The live feed in itself naturally attracted a lot of interaction, being rear-projected, the feed offered a true depiction of the room and its occupants, rather than the mirror image that most of us are used to. The recording and playback system worked particularly well and it soon became confusing to decipher from the projection who was actually currently occupying the room and who was a previous occupant, a memory of a past visit. The effect was most powerful when a previous memory of the current occupant appeared. Visitors found it particularly exciting to share a space and engage with a previous version of themselves. The structure of the patch meant that the recordings were taken after the camera feed had been passed through the data moshing

process, and so the recordings themselves were decayed. This meant that in the latter stages of the installation, the decayed live feed was overlaid with decayed recordings, leading to a doubly-decayed result.

An unforeseen but enjoyable outcome was that in these latter stages, since a recording is chosen at random from the pool, there would occasionally be a memory from the very start of the installation overlaid into the feed. This recording of course had been only very subtly decayed, so visitors were periodically allowed just a glimpse of reality. In the final stage, the user can no longer make out themselves as current occupants of the space, the feed has become so decayed that they simply manipulate the pixels with their movement, pushing and pulling colour around the screen. They begin to be able to actively decay the memories of the previous occupants that they are being shown.

A fascinating quality of the patch was its tendency to grasp pixels towards the end of the run. If, for example, a visitor entered the space wearing a bright red

t-shirt, the patch would capture the movement of that visitor as a trail of red, similar to a long exposure photograph. The red pixels would remain in the projection feed long after the visitor has left, like an embedded memory which is physical in that it is a record of past human presence, yet digital in that it is simply a collection of pixels. Of yet further interest is that these pixels remained live and editable, meaning that when the next visitor entered the space, their movement manipulated them. Often these pixels would attach themselves to the next visitor, clinging onto and following them around the space. The initial user leaves not only a memory of their visit, but directly influences the use of the space and the behavior of subsequent visitors long after they are gone.

The work of photographer Michael Wesely is sited here, and in particular his Potsdamer Platz project. The project documents the construction process of the Berlin site between 1997 and 1999 from five different camera positions. Each shot is a two-year-long exposure and the resulting images

11

"transform the chronological sequences of the construction activity into one simultaneous action, whereby an infinite number of individual moments overlap until they form a complex structure of fragments of reality. Before and after fuse together in that the previously, undeveloped horizon is still visible through the newly constructed buildings".

Our visual understanding is confused as new buildings seem transparent, and the daily path of the sun is traced across the sky as glowing streaks. Perhaps the most interesting quality of the images is their distinct lack of human presence, or of life in general for that matter. Due to the minute aperture size required to develop such images, the general movement of human beings is simply too quick to be captured. Instead we see a ghost town, deserted but with clear traces of the impact of humanity. We see what has been left behind, a memory of both the original site and the process of construction.

Similar to the later stages of the P3 installation, one can

manipulate the results without an image of themselves becoming incorporated into the imagery.[11.8]

11.8
Wesley, Michael, Potsdamer Platz, 1997-1999 (http://tr.im/xm7j)

11

Initially, the installation was to run for six days, however there also seemed a value in creating shorter versions, specifically one-day-long and one-hour-long, to suit other potential uses. It soon became evident that the initially planned six-day-long version of the installation was simply too lengthy for something that is intended to be purposefully visited, and that the one-day and one-hour-long versions were a lot more suitable. Visitors expected to see the results of their actions in real time. The average visit was maybe 2-3 minutes, but the shorter the overall length of the installation, the longer each visit tended to be. This is likely due to the immediate feedback available in the shorter versions, visitors are able to quickly see results, they see themselves alongside previous occupants, and often even alongside a version of themselves from only a few minutes ago.

11.P
Wesley, Michael,
Potsdamer Platz
Long Exposure,
1997-1999, from
Omentie's Blog
(http://tr.im/xq9a)

11.Q
Light sources
used to illuminate
installation
(http://tr.im/xqcl)

11.P

11.Q

11.R

11

A range of technical difficulties was experienced throughout the week of the installation. The patch itself behaved rather temperamentally, seemingly possessing a mind of its own and producing completely different results from almost identical conditions on different days. The main problem however was that of lighting, which required a very fine balance between providing enough so as to allow the distortion effect to work properly, but not too much as to wash out the projection screen.

Using a series of small lamps with shields an acceptable arrangement was achieved after much trial and error, but it became obvious that the patch would run much better on a large TV screen. The difficulty in this approach is that the element of poetry and depth inherent in the projection of the results is somewhat lost. As one can choose the surface onto which to project, something showing the signs of physical decay inevitably adds another level of pertinence.

Subsequently experimentation was carried out which saw the patch being run through a TV screen at a house party. As expected, much of the relevance and poetry of the thesis topic was lost in the scenario, yet the TV was certainly a far superior medium for displaying the results from a technical point of view. The results in this case were not particularly effective due to the relatively little movement of those being recorded, however this was an interesting experiment as an exploration of how the patch contributes to such a social occasion. Whereas often in similar environments, the TV is used to play, say, music channels as a backdrop to a house party, the patch builds up a gradually decaying depiction of the duration of the party, and somewhat amusingly acts as a metaphor for the gradually decaying inhibitions associated with these often alcohol-fuelled events.

There were also problems with the storage of the recorded files, which were very memory intensive. Retrospectively, more time would have been spent finding a suitable codec to compress the file sizes without the loss of too much quality, allowing the installation to run

without the need for an external hard disk. A firewire camera may have also helped speed up the general operation of the patch.

Experimentation with physical props during the installation was compelling, and this is something that lends itself well to further exploration. A single chair and a broom happened to be in the space during the installation, and in an optimistic move to increase the variety of visitor interaction, these were placed in the centre of the space. Visitors naturally began to interact with the objects, sitting in the chair, sweeping the floor with the broom and the like. Critically, the visitor would often leave the objects in a different position to that from which they had picked them up. Since the visitor would trigger a recording upon entering the space, the differing positions of the objects soon became overlaid into the projection, giving the impression that there were in fact two, three, four or five chairs and brooms in the space simultaneously. At this point the project draws firm parallels with the work of Lena Andersson, and her project Mnemonics and the Ghost in the

City.[11.9]. The project "attempts to create an architecture resonating with memory by utilizing the Renaissance Art of Memory and the second-order cybernetics of memory".

The site is a dilapidated house in Sweden owned by Andersson's family. The house has a rich and varied history, being used as a doctor's home, a farmhouse, and a grandmother's home, and Andersson developed a series of small, subtle architectures in the space, alluding to past events and interactions. The devices were constructed from simple household objects such as cutlery, part of a plow and even an ancient blood transfusion unit and were gently powered by wind-catchers in a nearby wood. This enabled them to slowly shift and creep about the space over long periods of time.

"These mnemonic micro-architectures exist in Rembrandtian shadow until they are occasionally highlighted by a redirected ray of sun".

The piece uses various technologies to form allusions, ambiences and minute

11.9
Spiller, Neil, Digital Architecture Now, 2008 — page 375

11

vibrations, and in some respect the P3 installation is a digital incarnation of Andersson's project. The objects moving over time are only evident digitally in the case of the P3 installation, their progress is viewed on the screen which projects them in their previous states. It could be suggested that in this case, the visitors themselves are the props, they are the physical architectures Andersson designs which move about the space, gradually releasing their memories. When the projection is in its latter stages of decay, the presence of the visitors is only revealed when they happen to move into an area in which the corresponding pixels can still be manipulated.
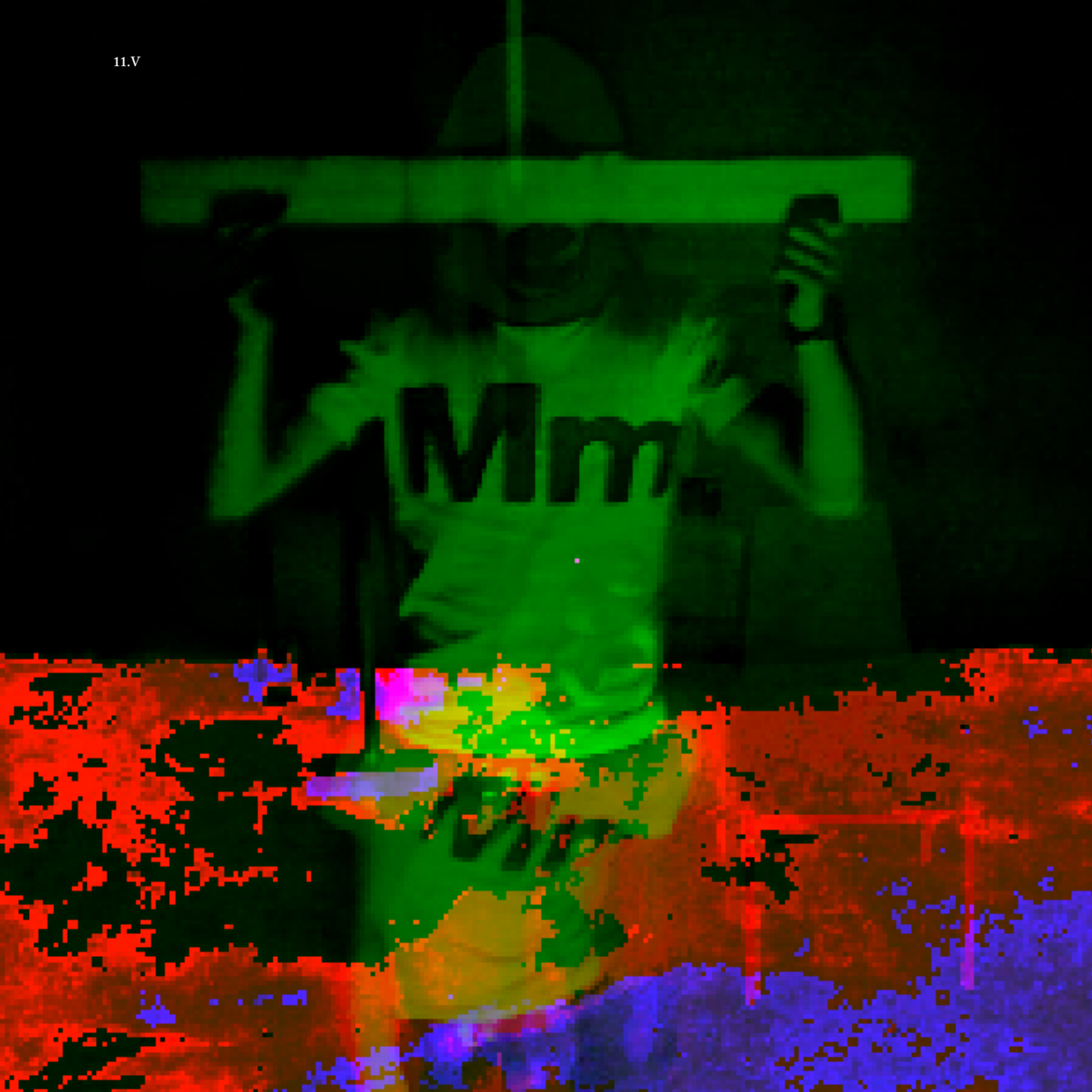
11.S

11

Some prominent results were also achieved when a visitor entered the space wearing a t-shirt featuring extremely bold graphical lettering. The black lettering on a white t-shirt seemed to almost cut through the decayed feed, it was at times barely effected and stood boldly and clearly in a sea of warped, melting pixels. There is further experimentation to be done with graphics, exposing words and signs during the recording process which could build up a poetically random set of memories.

Although possibly the ideal location to host the installation is a derelict building such as a pub or communal housing block which holds many fond memories for a relatively small but closely-knit group of people, there is a definite lure for its use in a public space. Through experimentation, it has become apparent the appeal of the installation being used in a space containing large amounts of passing people. Some testing was carried out in a busy thoroughfare space and this was particularly successful. When people are unaware of the

running of the installation they tend to respond enthusiastically upon discovering that they are being recorded. When visitors have no expectations or presumptions of the installation their behavior is both enthusiastic and natural. Any run of the installation which lasts more than 6 hours or so almost certainly needs to be something people passively engage with, something in a public space, rather than something which people are invited to actively visit and interact with. The installation is neither a static entity, nor is its location trivial. There are potentially many sites which could generate much interaction from visitors, and there is an interest in how the installation responds to these different sites. It could manifest itself into a touring artwork. There is also possibly an opportunity from a commercial point of view for the use of something similar to the installation in the likes of bars and nightclubs.

11.T, 11.U
Experimentation with physical props during the installation and the human body as the manipulation tool

11.V
Graphical forms during the installation

11

An important precedent for the installation idea is the *'Structural Decay'* project by Chris Coleman. Coleman's installation, located in a derelict, multi-story building is an audiovisual piece which explores the decay of an aging structure and how human influence has aided the shift of the space into a more entropic state. As users visit the installation their presence triggers audio and visual clips which relate to the respective spaces.[11.10]

11.10
Coleman, Christopher, Structural Decay Interactive AudioVisual Installation, 2001 (http://tr.im/xm8s)

11.W
Idea for siting the installation (http://tr.im/xqfq)

11.X
Still from Coleman's Structural Decay Installation (http://tr.im/xm8s)

SECTION TWELVE

EMBRACING THE 'DIGITAL NATURAL'

Do the ancient mnemonic teachings of 'The Art of Memory' still apply in today's digital world?

Upon reflection, many of the readings taken from the installation can be related back to Yates' The Art of Memory. In particular, the experimentation with props and graphics which is comparable to the ancient view that there are two types of memory, that of words and that of things. Yet another question is posed when this idea is related to today's society, is there now room for another form of data to be memorized, a third type of memory – *'Digitally Artificial'*? We now, surely, need to remember the bit and the byte as much as we need to remember things and words.

One could suggest that the memory of bits and bytes has in fact replaced the human artificial memory our ancients speak of. Today we have little need to remember such things as complex speeches word-for-word. The pen and paper, and more importantly the computer have all but removed the responsibility of memorising from us, leaving our minds free to embrace the natural memory that comes to us far more spontaneously. This would mean that artificial memory in

the original sense has become defunct, leaving still two forms of memory, albeit one of which is very different.

Conversely, one may clearly distinguish the collective human memory from the collective digital memory, considering them each as their own concept. Continuing the theme of metaphor and analogy, we may then consider the implications of relating the two forms of human memory depicted in The Art of Memory to digital memory. It is very clear that the *'digital artificial'* exists, the computer's ability to store data far outweighs that of our brains, but is there a *'digital natural'* memory? It seems that the unforced, unintended *'glitch'* may well be the manifestation of this *'digital natural'* memory.

We program our computers to act as intelligently as possible, yet we do not expect them to act in a way that we did not plan, and therefore commonly dismiss these glitches as malfunctions and faults. Maybe in this act we are overlooking our digital world displaying its own entropic, poetic, decaying, natural memory.

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Looking in further detail at digital memory, there are in fact two common types found in every computer, which reinforces this analogy. These are *RAM* and *ROM*. *Read Only Memory* is the permanently-written memory that we find on our hard drives. Contrary to popular belief, data is never actually removed from a hard drive when it is deleted, and requires ultraviolet light to completely remove. Traces can always be found by those knowledgeable enough. Random Access Memory is the type of memory a computer uses to process programs. It is volatile and requites the flow of electricity in order to store data. It is ephemeral. The similarities between digital memory and human memory are striking when one considers RAM and ROM.

Looking again at the spatial association technique that Yates explains was an important skill before the advent of recording and storage media, one can draw similarities with the operation of the installation. The spatial association technique sees the individual mentally place the objects to be remembered in

spaces they know well. They are effectively alleviating themselves of the responsibility of the memorisation, *'demanding'* the recollection of the objects when they mentally pace the spaces at a later date. This is the artificial, trained memory that is considered in antiquity. The installation is a physical space, into which one can store their digital memories. Because the system records the visitor, they are, in a way, again alleviated of the responsibility of memorising. The space acts like a hard-drive, indiscriminately storing whatever it is instructed to store. The mental pacing of the physical locus has become the scrolling of the digital folders. This is the new artificial memory.

A vast amount of experimentation and research has been undertaken during this project to explore the metaphors of memory and decay, yet clearly the most compelling and successful result was the chance discovery of a malfunctioning digital camera. There is of course great interest in writing, adapting and forcing software to behave in a way more humanistic, much of the results are both poetic and

artistic, yet there is a tremendous thrill in the discovery of a device which has suddenly, eccentrically begun to behave in a way which we do not expect. What is furthermore exciting is if this behaviour can be recognised as human in nature, as if the machine is not only displaying a form of digital natural memory, but that it is actually thinking for itself. Being lucky enough to come across a device like this camera, the emphasis in exploration immediately shifted from achieving visually impressive results to embracing the machine's erratic behaviour. It is only in these instances of unforced, unforeseen rebellion that we can truly claim a digital machine to be displaying hints of human behaviour.

This project was an exploration, a free license to take something so familiar for so many years and turn it on its head. It aimed to see the digital world in a new light, exploring and embracing those things that we instinctively allow ourselves to be tormented by. Yet through the exploration of the metaphors with which we refer to our digital world, the realisation has been that many

are in fact barely metaphors at all. Digital Memory is so different and yet so similar to Human Memory, but the term Memory itself is now entirely ambiguous. Its definition refers as much to the bit and the byte as it does to human mnemonics. The development of our culture and its transition towards a digital manifestation has resulted in this ambiguity. With this in mind, is there a possibility of the concept of decay following in the footsteps of memory and coming to refer to the digital realm as much as the physical? With the rapidly increasing understanding and control humanity has over its computers, along with the rapid advancement of computer technology itself, it is maybe time that we begin to accept the flaws of computers. As we strive to create 'artificial intelligence' (another metaphor), should we not expect the results to display the negative aspects of the human mind as well as the positive?

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FURTHER READING
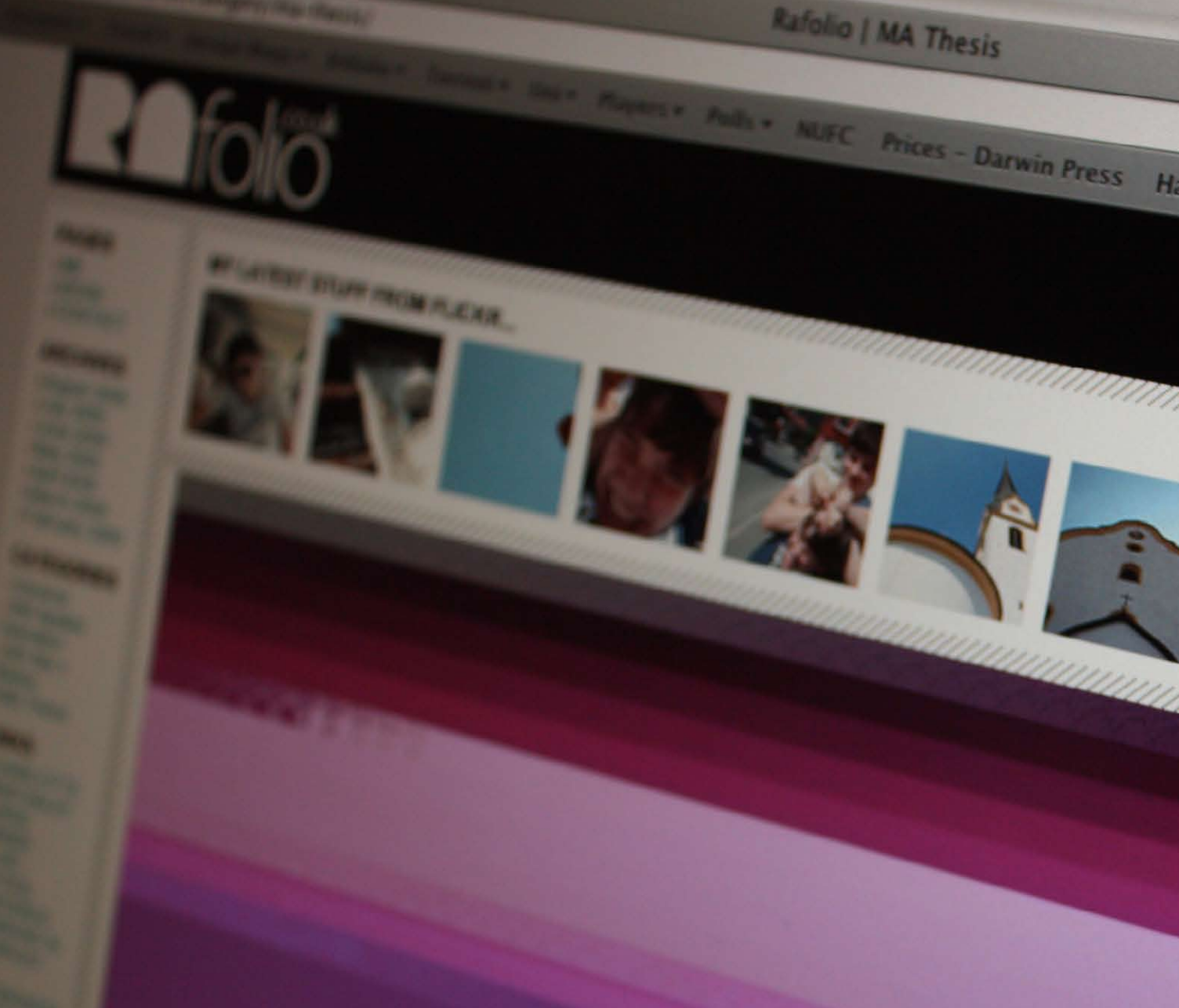
Full and thorough documentation of the project can be found online at my personal blog:

http://blog.rafolio.co.uk

Images documenting research, experimentation and the installation itself may be found at my Flickr account:

http://flickr.com/rafolio

Video documentation of software experimentation and the operation of the installation may be found at my Vimeo account:

http://vimeo.com/rafolio

Image overleaf generated from Ted Davis' IMAGE_REMIX online project (http://tr.im/xlZ8)

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