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Fake Bit: Imitation and Limitation

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ABSTRACT

A small but growing trend in video game development uses the "obsolete" graphics and sound of 1980s-era, 8-bit microcomputers to create "fake 8-bit" games on today's hardware platforms. This paper explores the trend by looking at a specific case study, the platform-adventure game *La-Mulana*, which was inspired by the Japanese MSX computer platform. Discussion includes the specific aesthetic traits the game adopts (as well as ignores), and the 8-bit technological structures that caused them in their original 1980s MSX incarnation. The role of technology in shaping aesthetics, and the persistence of such effects beyond the lifetime of the originating technologies, is considered as a more general "retro media" phenomenon.

Keywords

Video games, retro, 8-bit, platforms, MSX, sprites, pixels, media, aesthetics, software studies, platform studies.

1. INTRODUCTION

Today, the commercial games industry is increasingly recognizing the potential for a "retro" market, resuscitating its back catalog of older titles via digital distribution on Nintendo's Virtual Console for the Wii, Microsoft's Xbox Live Arcade, and elsewhere. This in itself is a meaningful development for the medium and business of games, an explicit recognition (and economic legitimization) of its history. But why stop at re-packaging older titles? This paper examines a recent aesthetic trend of retro styled – but entirely original – video games. These "faux 8-bit" games display all the hallmarks of a 1983 blockbuster: chunky pixels, pastel color clashes, and lo-fi chiptunes. Adopting technologically "obsolete" audiovisual conventions for a new generation of software and players, they exhibit a stylized self-awareness of technologies, aesthetics, and genres, and the underlying relationship between them – the kind of reflexivity that is central to advancing our critical understanding of video games as a medium.

To illustrate, I take an in-depth look at *La-Mulana*, a puzzle-centric platform-adventure for Windows PCs, created by a Japanese amateur development team called the GR3 Project (now known as Nigoro). Originally written in Japanese and released in 2005, an English version (patched by the fan translation group Aeon Genesis) was completed in early 2007, considerably expanding the game's audience, and bringing with it high critical praise: one reviewer simply said "It's the best game I've played in a year" [14]. *La-Mulana* belongs to the subgenre of 2-D platform-based action-adventures, which originated in the 8-bit console era most prominently with the classic *Metroid* (Nintendo, 1986) for Famicom/NES. Unlike a traditional action platformer, the emphasis is on world exploration, with a degree of non-linearity and player discretion. The genre borrows elements of methodical puzzle-solving and incremental character development from

adventure and role-playing games, which are traditionally less action-oriented. Several lesser known NES games contributed to the style early on as well, such as Hudson Soft's *Faxanadu* (1989) and *Milon's Secret Castle* (1986), as well as Konami's *The Goonies II* (1987). In more recent decades, the *Castlevania* series from Konami has also adopted and advanced the form, from *Symphony of the Night* (1997) on PlayStation, through *Portrait of Ruin* (2006) for the Nintendo DS.

La-Mulana is an extremely well made title that ranks among the finest in this genre, displaying unusual craftsmanship and cohesiveness. Its player-protagonist is Professor Lemeza, an archaeologist explorer charting out vast underground ruins in a distant, unspecified corner of the globe (Indiana Jones is an obvious pop culture reference, but also earlier examples like H. Rider Haggard's late nineteenth century pulp paperbacks). Though the game provides plenty of fierce action and demands a relentless on-guard posture, the player's progression is mostly dependent on the solution of cryptic riddles and other challenges of logic, with a familiar "start from zero knowledge" conceit: the player arrives at the ruins with no map and only the vaguest of rumors, setting the stage for the free-roaming, hostile territory common to the genre.

Figure 1. *La-Mulana* **is a 2-D action-adventure in the tradition of** *Metroid* **and** *Castlevania***. Though it was created in 2005, the game uses retro-styled graphics to evoke its 1980s predecessors.**

What really sets the game apart, however, is its distinctly recognizable retro visual style, and from the title screen onwards we are treated to a sparse, "8-bit" styling. While *La-Mulana* is in fact an ordinary, contemporary Windows game without any special technical capabilities (or limitations) of note, it mimics a very specific older game technology: the MSX, an 8-bit home

computer popular in Japan in the mid-1980s. This self-stated adoption of the MSX platform – the creators cite Konami's *Maze of Galious* (1987, also known as *Knightmare II*) as their primary point of inspirational reference – makes the game an attractive case study, because it explicitly foregrounds its retro aspirations, while giving us specific technological heuristics by which we can analyze it. Nick Montfort and Ian Bogost have established the approach of *platform studies* as a means of understanding a program's technical basis in context: "the investigation of underlying computing systems and how they enable, constrain, shape and support the creative work that is done on them" [9]. The distinct bundles of hardware and software that make up a platform profoundly shape the kinds of games that are (and can be) made for it: 2-D pixel-based systems favor side-scrolling platformers and top-down maps; native support for 3-D polygonal graphics has made the first-person shooter a mainstay; the lighting effects of today's programmable shaders encourage further stylistic distinctions like the shadowy "survival horror" genre. Though *La-Mulana* is not actually written, compiled, or executed on a real MSX computer, the game's conscious imitation of (as well as dissonance with) that system makes for a degree of platform study by proxy.

2. AN "MSX-STYLE" GAME

To fully understand *La-Mulana*'s aesthetic and cultural references requires some background knowledge on the MSX itself. Though the system was never seriously marketed in the United States, the MSX was a successful platform, particularly in Japan: it sold over 5 million units worldwide, and maintained its relevance alongside the fierce competition of Nintendo's better known Famicom (branded the Nintendo Entertainment System in the U.S.); both machines were released in 1983. Notably, the MSX hosted the first titles in significant franchises that have remained strong to this day, including the inaugural *Metal Gear* (Konami, 1987) and *Bomberman* (Hudson Soft, 1983) games.

As a computational platform, the MSX had an unusual genesis: the brainchild of Kazuhiko Nishi, a Microsoft executive at the company's Japanese branch, it was an attempt to standardize the nascent PC market by providing clear guidelines for hardware manufacturers. Rather than building or assembling the machine itself, Microsoft instead specified which components third party vendors should use in order to make their computers "MSX compatible". Over fifteen years later Microsoft would consider the same standards-based approach when planning its Xbox console, before rejecting the idea in favor of keeping production centralized [16]. The MSX was a general-purpose computer rather than a strict game console, but its graphics and sound chips (from Texas Instruments and Yamaha, respectively) provided 2-D hardware acceleration and music capabilities that were lacking on regular PCs. The reliability of standardization made it attractive to game developers, who dominated the machine's software library. In relative technological horsepower, the initial MSX1 was more sophisticated and had a higher pixel resolution and greater graphical variety than predecessors like the Atari VCS 2600 and Intellivision consoles, but lacked some important features of the rival Famicom (such as continuous scrolling). The audiovisual components were later upgraded with the MSX2 specification in 1986; *La-Mulana*'s chief reference point is the MSX1.

Much of *La-Mulana*'s 8-bit aesthetic is tied to its self-imposed graphical limitations. To start, the native resolution of 256x192

pixels is (as we would expect) much less granular than contemporary standards, which deliver 640x480 pixels on the low end, with the Xbox 360 and PlayStation 3 consoles supporting far greater detail up to 1920x1080 pixels as HD (high definition) television is ushered into more homes. As with most of its technical guidelines, *La-Mulana*'s 256x192 resolution matches that of the original MSX1. By default, the game scales up to a full-screen display in Windows, restoring the familiar coarseness of NES (256x224) and PC EGA or VGA (320x200) era titles. Conveniently, the currently common PC resolution of 1024x768 is 4 times greater than that of the MSX1 on both axes, allowing *La-Mulana*'s original pixels to be easily blown up to an area 16 times their original size. If desired, the user can also opt to play in a windowed mode – and doing so makes the game so tiny that the vast differences in detail are immediately driven home.

Nonetheless, *La-Mulana*'s graphics are dense enough to depict reasonably recognizable representations of "real-world" objects and environments: from stone statues, to waterfalls, pottery, birds, and skeletons, right down to the player's hat and whip. There is a noticeable increase in fidelity over the stereotypically blocky style of the Atari VCS console, where highly abstract games like *Breakout* (Atari, 1978) and *Kaboom!* (Atari, 1981) were common. For example, Atari's *Adventure* (1979), the progenitor of the entire action-adventure genre, was so visually constrained that it represented the player's character on screen as a simple square, while the sword looked more like an abstract arrow shape. *Pitfall!* (Activision, 1982) is the closest VCS comparison to *La-Mulana* in theme and gameplay, but despite its reputation for pushing the system's graphical limits (pioneering techniques for multi-color sprites), the wide rectangular pixels and severe limitations on the simultaneous display of sprites favor broad splashes of solid, contrasting colors, with each screen literally centered on a single interaction (as the VCS has a technological predisposition to symmetrical environments).

Figure 2. The MSX was a hybrid console-computer, popular in Japan in the mid-1980s. Though it looked much like other personal computers of the time, its standardized cartridge format and graphics acceleration made it attractive to game developers. (Photo by Paolo Tonon. http://commons.wikimedia.org/wiki/Image:Canon_V-20_MSX_computer.jpg. CC-BY-SA 2.0).

While pixel resolution is arguably an important criterion for a more general concept of retro game style, *La-Mulana*'s particular look actually owes more to its palette, which is limited to a mere 16 colors. Replicating the palette of the MSX1, these run the gamut from gaudy cyan, to neutral brown and gray, to deep primary red; though not a perfect match, U.S. players unfamiliar with the MSX would likely recognize *La-Mulana*'s often jarring juxtapositions as similar to those of PC EGA games (also 16 colors). Because the palette is fixed throughout the game, much of the artistic accomplishment surrounds creatively mixing these 16 colors, using dithering techniques to achieve distinct moods in each of the game's areas: the grassy village outside the ruins, the huge red stone monuments depicting the god-like creatures of the "Giants' Mausoleum", and the faux Egyptian tombs of the "Temple of the Sun".

But where *La-Mulana* ups the ante is in its more subtle adherence to the MSX1's specific limitations on the spatial distribution of colors. One of the platform's most interesting peccadilloes is that within the background layer, each horizontal segment of eight pixels can only consist of two distinct colors. This is due to the particular manner in which the data for each eight pixel row is stored, across two bytes. The first byte determines *which two colors* should be used from the 16-color palette; this is done by each set of four bits (out of the byte's eight bits total) selecting a color (since together, four bits have the capacity to store 16 different values). The second byte then uses each of its eight bits, *one for each pixel*, to indicate (via a setting of zero or one) which of the two previously selected colors should be shown for that pixel. So while the specific colors used can be altered from segment to segment, the two-color restriction puts significant "local color pressure" on the visual design, and encourages the use of gradients with horizontal bands to create a sense of texture or sheen – an effect evident from *La-Mulana*'s title screen logo to its environmental backdrops. Furthermore, while the MSX1 did provide basic support for freestanding sprites (that could be placed anywhere on screen, unlike the fixed location of its background tiles), each sprite graphic is limited to a single color (plus transparency, for a total of two values, or one-bit-per-pixel). As a result, most of *La-Mulana*'s characters and enemies are flat silhouettes that require the artist to carefully attend to shape and outline. The color palette plays a sometimes subliminal but significant role in establishing a platform's visual style, so *La-Mulana*'s particular 16 colors provide an effective cue of its MSX origins; even the Atari VCS, which generally only allowed four unique colors to be shown per line, still had a far larger palette of 128 overall colors from which those four could be chosen. By contrast, every pixel of every MSX1 program had to be picked from its lonely 16 color palette.

As players, we don't need to consciously recognize or understand all (or even any) of *La-Mulana*'s specific technological constraints in order to appreciate its aesthetic style, and to intuitively identify it as "8-bit". The MSX's computational similarities to other platforms in the same "family" – the Nintendo Famicom/NES, the Commodore 64, among others – create a wider, more accessible aesthetic and cultural touch-point. The game appears to be attractive to retro-minded players in the U.S., for instance, despite the MSX being almost unheard of in this market. *La-Mulana*'s self-assigned and abided rules create such specificity that even without an explicit statement of connection (as the game provides), a devoted MSX fan would likely recognize the visual inspiration purely from the phenomenological

experience. Yet as I've begun to show here, it is also not simply a nominal difference to say that *La-Mulana* is an "MSX style" game rather than only an "8-bit style" game. The MSX has specific technical limitations, some of which are unique to its particular systems design, and these fundamentally impact the platform's range of possibility, not just in visuals but also in gameplay.

3. AN 8-BIT GAME WITH CONTEMPORARY AMBITIONS

Indeed, while the influence of the MSX is most immediately apparent in the game's visuals, if we read what the game's developers themselves have to say about their intent, graphics are never explicitly mentioned. Instead the inspiration initiates from gameplay, and more specifically the concept of challenge. *La-Mulana* is a deeply difficult game, which the developers describe as a reaction to "the new-style of really easy games", going on to say: "it may be very hard to beat *La-Mulana*. But that's OK. We're looking for those gamers that could in days past defeat Druaga [*The Tower of Druaga*, Namco, 1985], bring the baby back safely from the clutches of Galious [*Maze of Galious*], and seal the Evil Crystal [*Hydlide 3*, T&E Soft, 1987]" [7]. There is a two-part supposition here: first of all, that the trend of gameplay in the commercial industry has been from harder to easier; and second of all, that an earlier platform style can reset that clock, triggering an association with those older, harder games, and the set of gameplay expectations that come with them. The evocation of 8-bit gameplay is at least as important as, if not more so, than that of 8-bit graphics. And the developers have bent over backwards to categorically associate the game with the long defunct MSX platform because they believe the two are associatively linked for gamers.

We can follow this trail from hardware to gameplay in *La-Mulana* with another MSX1 example: the system's lack of support for a graphical effect known as "smooth scrolling", in which the entire background image could be moved left, right, up, or down in pixel-by-pixel increments, enabling the illusion of the screen as a window into a much larger, continuous world space. Smooth scrolling was a signature difference between "early" 8-bit computers like the Atari VCS, on which backgrounds were largely static, and later, more mature 8-bit systems like the Nintendo Famicom/NES, which popularized the side-scrolling platformer genre most notably with *Super Mario Bros.* (Nintendo, 1985). Smooth scrolling hardware capabilities were far from a given in the time of the MSX, but the feature was common enough amongst its contemporaries. The Commodore 64's VIC-II graphics chip, for instance, has a register (a mechanism for programmatically operating computing hardware by toggling and configuring low-level features through the manipulation of individual 1-or-0 bits) that allows the screen to be finely scrolled one pixel at a time. The ZX Spectrum (popular in its British home territory) has no such specialized register, and in fact lacks a dedicated graphics chip altogether, requiring the main CPU to do all the heavy graphics lifting. Yet a reasonable form of smooth scrolling is still possible by way of the "block" instructions available on its Zilog Z80 CPU, enabling large areas of video memory to be filled in or copied all at once (thus the whole screen can be shifted a small number of pixels by brute force).

The MSX uses the same Z80 CPU as the ZX Spectrum – *and* has its own dedicated graphics chip, the Texas Instruments TMS9918A – so on its face it is reasonable to expect the system

to be more suitable to graphics-intensive techniques such as smooth scrolling. Yet the peculiar nature of the TMS9918A complicates matters on two fronts. First of all, the video buffer (where the image to be displayed on-screen is stored) is non-linear: the pixels are not laid out sequentially, but are instead out of order in relation to their positions on the screen. Secondly, the chip does not allow direct access to the video buffer, and actually precludes the use of the system's other natural hardware capabilities by requiring programmers to go through the much slower I/O ports: "accessing video memory involved first outputting the low then the hi bytes of the video memory address to I/O port $99, then the 8-bit data to port $98… This also meant that the fast z80 blockmove and blockfill instructions could not be used on the video memory" [10]. Both issues prevent the MSX from using the Spectrum-style scrolling techniques. And therefore, a hardware bundle that is ostensibly more powerful (Z80 plus TMS9918A) is in practice more constricted.

Fine grained smooth scrolling was ruled out on the MSX1, but a herky-jerky approximation could be achieved in 8-pixel increments, shifting the entire background over one 8x8 pixel tile at a time. To adhere to these constraints, *La-Mulana*'s world space is displayed as a vast series of contiguous (rather than continuous) single-screen areas, often called "rooms" in genre parlance. While the backgrounds are usually fixed, quick chunky scrolling transitions slides one area over into the next each time the player reaches the screen edge of a room. The chunky, non-interactive scrolling method shows what a mid-position the MSX was in compared to its 8-bit relatives, able to partially adopt aspects of continuous spatial representational from newer 2-D scrolling games, while remaining significantly barred from others. Certainly the technique increases the spatial coherence of such a large world by reinforcing mental cues to its layout. Landmark Atari VCS titles *Adventure* (the first game to use the contiguous room model) and *Pitfall!* have no such transitions, and instead simply re-draw the entire screen immediately when the player changes rooms. Were *La-Mulana* a "VCS-style" game (not at all a stretch given the system's larger fan-base) this feature would have similarly been absent. On the other hand, self-imposed restrictions vis a vis a game's native hardware are themselves nothing new: the first *Legend of Zelda* game (Nintendo, 1986) also uses the single-screen, transitional-scrolling method, despite the Famicom/NES's full support for smooth scrolling. The "room" mode of spatial representation is borne from a mix of technological necessity and intentional design choice.

Typical for both room-based game spaces and 1980s era gameplay more generally, non-player characters and enemies in *La-Mulana* are confined to the area of their own local room screen, and they will not follow the player across screens. Action scenarios are choreographed around specific, partially predetermined room set-ups, with pseudo-random elements introduced through techniques such as multiple potential enemy spawn points. Such containment is convenient to the MSX's limit of 32 total simultaneous sprites (with a maximum of four allowed per line of pixels); juggling the display of an indeterminate number of characters across a free-roaming world composed of hundreds of screens would be atypical for the machine, even if it might be possible (the same might be speculated as a factor in *Zelda*'s avoidance of a free-scrolling world on the NES). Continuous action is therefore de-emphasized to some degree. Though the game does require complex execution of real-time actions (many of them quite challenging), a reconnaissance style

of exploration is enabled by both the ability to escape local battles by leaving the room, and through the Grail, an item acquired early in the game which allows the player to warp instantaneously to a handful of key checkpoints. In another technique borrowed from 8-bit classics, many puzzles depend on "clearing the room" – defeating all enemies in the immediate vicinity – in order to trigger events or reveal items. These natural pauses also provide for a good blend of action with slower, thought-focused riddles.


Figure 3. *La-Mulana*'s low-resolution, 16-color graphics follow the conventions of the 8-bit MSX computer, which limited horizontal color variety. Instead, the system favored vertical bands of solid colors, seen in the title screen lettering, as well as the ladders and bricks of the in-game graphics.

The MSX-adopted limitations on pixel configuration and color distribution also create background graphics that are highly repetitive within each area of the game world. But rather than attempting to "overcome" this, the game naturally orients itself in this direction. In the tradition of *Adventure*, many of *La-Mulana*'s underground rooms are very similarly templated, with slight variations that create a sense of labyrinthine confusion. Distinguishing between these rooms is a key challenge – it is a designed psychological task of gameplay, a simple visual example of the developers' overarching intent to make you slow down, take your time, and carefully observe your surroundings. As the designers chide:

You can proceed however you like, but if you solve riddles and don't pay attention to how the ruins change accordingly, that's not very archaeologist-like!....Try not to miss changes in the ruins, things that seem out of place, or strange mechanisms just because you didn't look them over carefully enough! [7]

In fact, the game's translators even advise taking sequential screenshots (using extra-game utilities) of rooms and tablets as an aid to deducing one's progress [8]. It's a strategy reminiscent of the 8-bit adventure game tradition encouraging (sometimes requiring) the player to create hand-drawn maps of the game world, with a twist that suggests the play-style of recent "camera"-based games, in which visual evidence is gathered directly from within the game world itself (such as *Fatal Frame*, Tecmo, 2001, or *Dead Rising*, Capcom, 2006).
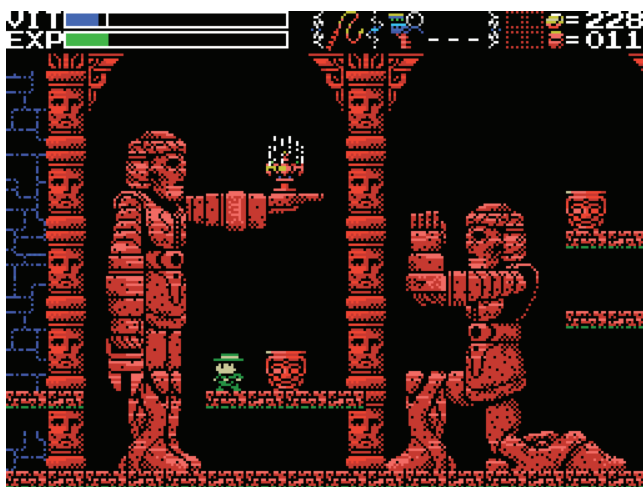
Figure 4. Players must pay close attention to the poses of the statues in the Giants' Mausoleum. Completing a puzzle in one room may subtly alter a statue in another.

La-Mulana's designers have consciously aimed for a style of play that does not simply replicate its classical models, but adapts and evolves them. Recounting their development and play-testing process, they describe an initially vague but continually nagging self-recognition that while they worked ever more to match the source of their inspiration, a sense of satisfaction did not follow, even in their success. Coming to a moment of design crisis midway through, they concluded that "in the end, what we had was nothing but a cheap *Maze of Galious* knockoff" [7]. Their response, interestingly, was a direct attempt to inject contemporary (that is, current platform generation) gameplay trends into their design: they "wondered if it might not be possible to incorporate the sense of tension in newer games like [the] *Metal Gear* [*Solid* series, Konami, 1998-]" [7].

What they pivoted towards was a design best described as contemplative. They espouse this philosophy as follows:

We tried to make it so that people wouldn't get hopelessly stuck everywhere, but if you just whack walls at random without thinking you'll die. If you think "Ooh, a treasure!" and run charging toward it without thinking, you'll die. If you just operate a mechanism without thinking about how it works, you may end up not ever being able to get a specific item. If you think

"I'm trapped! I'm going to warp out!" and do so, you won't be able to get back into that room from the outside. Once you do finally manage to find your way back in, you may be confronted with an even more obnoxious mechanism to overcome than before. If you make enough big mistakes it will even become quite tough to complete the game [7].

The design demands self-regulated pacing and patience from the player. One of the most commented upon aspects from new players is its difficulty at the outset: initially, players cannot save their progress (until they have purchased the Game Master MSX ROM), cannot read the ancient tablets that contain the majority of clues to the game's riddles (until they have acquired the Hand Scanner accessory which translates this text), and even assuming one did manage to successfully solve a puzzle under these conditions, they would not receive any positive feedback or encouragement alerting them to this fact (until finding the Shell Horn, which sounds a note each time an action is completed). Many of the basic scaffolding capabilities that players have come to expect are noticeably and intentionally absent. To sum up: "we decided to put in the fear of death" in *La-Mulana*.

As *La-Mulana*'s particular subgenre of 2-D platform-adventure has seen a recent resurgence of critical interest, its roots are undergoing a reappraisal. *La-Mulana* has fared well in the comparison:

[S]omehow, *La-Mulana* manages to avoid the clunky presentation and gameplay which has aged the real 1980s games so dramatically. Operating without real 8-bit constraints, the developers have made an 8-bit game with modern ambition. It makes me want to throw away my next-gen devices, but at the same time it is richer and more satisfying than any game I could find for an emulator. *La-Mulana* is deeper and more complicated than any other game with 16-colour graphics, though it is never inaccessible or obtuse. It is exceedingly difficult without ever feeling arbitrary [14].

Difficulty may be central to *La-Mulana*'s charter, but it is a challenge built on clarity of presentation and logic, rather than the charges of obscurity often leveled at similarly large, non-linear 8-bit worlds. Take, for example, 1UP.com editor Jeremy Parish's assessment of *Faxanadu* (1989, NES): "there's a certain element of abstraction to the whole thing – vaguely-translated objectives, unexplained item effects, a bit of trial-and-error – but do recall that this is the 8-bit era we're talking about" [11]. *La-Mulana* aims to correct these flaws and evolve past them by adopting qualities of the 8-bit form; thus its design began grounded in nostalgia, but ended up driven by critique.

From a perspective beyond strict technology and game design, we also ought to remind ourselves of the changed nature of global communications today, two decades after the MSX and NES heyday: *La-Mulana* is blessed with an excellent English translation that was done entirely by dedicated fans. The game's English text is clearer than that in a great number of Japanese commercial games of the 1980s. Such quality is crucial to understanding its complex system of logic and riddles, and the title's appeal outside of Japan would be severely limited without it – a fate many of its 1980s predecessors endured in the United States. Further mitigating its difficulty, an exhaustive series of walkthrough videos (comprised of 89 individual segments)

appears on YouTube (again courtesy of a fan). These tutorials can be especially helpful in starting the game, and as of August 2009 the opening episode had garnered over 100,000 views [12]. *La-Mulana* was designed in a far more advanced (and commercially independent) environment of cross-cultural reception.
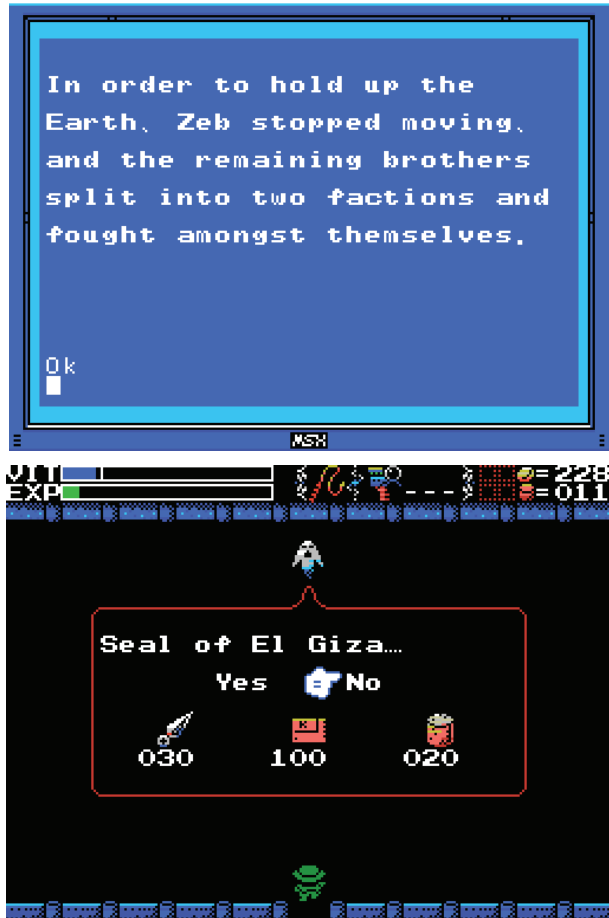

Figure 5. Despite their amateur origins, *La-Mulana*'s textual riddles and conversations are better translated and more intelligible than their professional predecessors from the 1980s.

4. LOST IN IMITATION

How might *La-Mulana* have been different had it been developed for an actual MSX? Many hobbyist programmers, for instance, do continue to create games for the MSX platform today, so the option was clearly available. On one hand, *La-Mulana* goes to great lengths to match the observable behavior of the MSX. On the other hand, this imitation is clearly selective and intentional, a vehicle for stylization. And there are technical aspects of the platform that are not adopted or enforced, fundamental low-level structural elements such as the maximum addressable memory space. These limitations were often significant hurdles to programmers writing real-time graphics code on 8-bit platforms, and while they could be overcome through skilled coding, *La-Mulana*'s programmers, developing on the much more "friendly" and flexible environment of the modern Windows-compatible PC, were able to conveniently skip these challenges, and instead implement only those ultimately resulting visual behaviors which

they deemed relevant and necessary to their goal of aesthetic association. In some circumstances, such differences in the processes of production and operation may not be detectable to the player at all. Yet in other cases, *La-Mulana* does flaunt some MSX1 specs, bending the color distribution rules for the player sprite of Professor Lemeza (adding a thin black outline to make the character more legible), and ignoring the flicker caused by more than four simultaneous sprites per line. It's possible that the extra colors employed for the player sprite might be achievable on the MSX1 through multi-sprite overlay techniques (in which two or more sprites are stacked upon one another) or other tricks. In this case, *La-Mulana*'s pixel artist simply gave himself the benefit of the doubt.

It is often quite difficult to determine – not just in advance but also in retrospect – how specific technical platform qualities will manifest themselves in software behavior. Or trickier, to predict how initially undesirable or negatively associated technical artifacts can actually have indirect positive effects, or even become attractive themselves over time. Take the MSX's sprite limitations, which as previously noted display a maximum of four sprites per horizontal line of pixels on screen. When programmers exceed this limit (consciously or unconsciously), the result is that part or all of the fifth sprite, sixth sprite, and so on are simply skipped and not drawn at all. The system does offer a way to mitigate the problem, however, by deciding which sprites should be drawn and which should be skipped: "Sprites with a higher priority are drawn first. The VDP [Video Display Processor] reports in a status register the number of the first dropped sprite. The CPU can get around this limitation by rotating sprite priorities so that a different set of sprites is drawn on every frame. Instead of disappearing entirely, the sprites will flicker" [17]. Developers often make this tradeoff in graphical consistency, preferring to create games with more than four simultaneous, horizontally overlapping sprites – though the technique can only reasonably support up to around six sprites before the flickering becomes too distracting. This effect of sprite flicker is extremely common across 8-bit platforms, and recognizable to any gamer acquainted with such systems.

La-Mulana does limit the number and position of its sprites to approximately those of the MSX, but not with complete accuracy or fanaticism (while there are generally no more than four sprites on any line, there also doesn't appear to be any specific policing of this requirement). More importantly, the game makes no attempt to re-create the flickering seen on real 8-bit hardware. And the same is true of the vast majority of faux 8-bit games, despite the widespread prevalence of sprite flicker in their historical sources of inspiration (to my knowledge, the only example of a game that *does* implement a "fake flicker" is *Mega Man 9*, though this is only visible when the player enables "legacy mode"). While flickering could easily be considered as essential to the aesthetics of 8-bit gaming as color palette and pixel resolution, it is instead more often perceived as a glitch, a technical limitation to be left behind rather than preserved.

Generating pixels within the internal memory of the machine itself is just part of the hardware equation: most 8-bit home computers, the MSX included, output a standard CRT (cathode ray tube) TV signal (NTSC in Japan and North America, PAL in Europe, etc.). The images on CRT televisions of the 1980s were substantially less precise than those we see on our super-stable LCD screens today (or even on the dedicated CRT computer

monitors that were standard in the 1990s, which had much higher refresh rates than TVs did). These CRTs were blurry, noisy (think TV snow and poor reception), the colors bled into one another, and the relative intensities of colors to one another (known as "temperature") were different. Sprites looked less blocky. 8-bit artists took all this into account quite naturally, because the displays they were developing on themselves exhibited these qualities. When we view the palettes and pixels of the MSX, the Atari VCS, or the NES on an LCD (whether on a screenshot online, through an emulator, or within mimic software like *La-Mulana*), we are literally not seeing the same colors and shapes.

A recent comment from a homebrew developer creating a role-playing game for the 8-bit TI-99/4a computer (which shares the same TMS9918A graphics chip as the MSX, and thus the same 16 color palette) illuminates the difference in practice:

> For example, I originally had my foothill tiles in dark and light yellow. Then I discovered on NTSC that you couldn't really see the color differences. They also didn't appear very distinct against desert tiles. My solution was to change the light yellow to dark red. On a crisp emulation display, it seems a little jarring. But on an NTSC display, it's subdued, and even comes close to making the hills seem more "brown" [3].

Yet this example aside, the hallmarks of CRT displays, as with sprite flicker, are ignored much more often than not in today's treatment of 8-bit aesthetics (both in emulation, and the production of new software). At least two examples come to mind that show that awareness is improving, however. Ian Bogost challenged his students at Georgia Tech to modify the popular Atari VCS emulator Stella, adding graphical post-processing to simulate many of the properties of CRTs [1]. And on the faux 8-bit side is the indie game *Beluga Mk II* (T. Matsushima, 2008), a horizontal shooter with an astronaut protagonist that recalls a childhood spent 12 inches from the TV screen, with a fuzz filter and four-color palette of fully-saturated green, blue, red, and yellow, that evokes the blur and bleed of a CRT. All these hardware properties – color selection and pixel resolution governed by the CPU and graphics chips, or clarity and brightness shaped by the optical effects of the screen – are interdependent, and their compound effects are not always linearly cumulative. Picking and choosing (as a faux 8-bit game like *La-Mulana* or *Beluga Mk II* must) can significantly, if at first subtly, alter these games' "8-bit" character.

Another illustrative case from the world of today's 8-bit hobbyist homebrew developers is found in *The Cure*, a platform game inspired by *Vampire Killer* (an early MSX entry in the *Castlevania* series), created in 2005 for native MSX hardware and winner of the MSXdev'05 programming competition. *The Cure*'s developer chose to minimize MSX sprite flickering by drawing enemy characters on the actual screen background itself, rather than through sprites (the traditional method). The 8x8 background tiles are simply replaced with images of the game's enemies, such as a skeleton. As with sprite flickering, this was a conscious compromise on the part of the programmer: because the skeleton is drawn on background tiles with fixed positions every eight pixels, it can not be moved smoothly and freely as it approaches the player character. Instead, the skeleton "jumps" across the screen in eight pixel increments, similar to the "chunky" scrolling used to transition between room screens in *La-Mulana*. This low granularity motion is arguably more distracting in the case of *The*

Cure, though, because the player's eye is often drawn directly to the enemies, as opposed to the brief, non-interactive use it serves in *La-Mulana* (in the latter case, there is no negative gameplay consequence to the animation being less smooth than one might want, while in the former, misjudging the enemy's position because of an imprecise graphic could actually cause the player harm). On the other hand, in return for this sacrifice *The Cure*'s developer gained the ability to devote *all four* MSX sprites to the display of the player character, overlaying them on top of one another to increase the number of available colors from one to four and therefore substantially upping the character's detail level in comparison to most MSX titles.

Figure 6. *Beluga Mk II* evokes a fuzzy Cathode Ray Tube television with its blurry and cheerfully bright blue, green, red, and yellow colors.

But amongst *The Cure*'s very positive reception, another MSX developer made an observation in comparing it to its source of inspiration:

> One thing that bugged me a bit in *The Cure* was exactly the fact that with tile enemies you didn't have a real limit, as with sprites. [W]hen climbing stairs in [*Vampire Killer*] there was usually a limit for those purple witches so there was a chance to actually reach the higher platform. But in [*The Cure*] they just kept coming and coming. So, in [*Vampire Killer*] this sprite limit at least contributed to the gameplay/balance [13].

The following chain of events had occurred: the MSX's four-sprite maximum was viewed as a gameplay hindrance because it limited how many simultaneous enemies the developer could display. Because increasing the number of sprites would have caused flickering – an undesirable visual artifact – the developer instead decided to cleverly use the background tile method for representing the game's enemies. Yet without the natural limit provided by the sprite hardware, the developer actually unwittingly *overloaded* the game's difficulty. In other words, hardware sprites on the MSX often play the classic role of a prescribed artistic constraint, and circumventing them is far from certain to lead to "improvement".

While no such similar sprite charges have been leveled at *La-Mulana* (a game that is deeply difficult for other reasons, yet never physically overwhelms the player in this manner), the

lesson is that the manifestations of hardware are unpredictable. When we're trying to create a piece of software that mimics the *observable behavior* of an 8-bit platform, how do we determine what "observable" is? As *The Cure* shows, the answer to this question isn't straightforward even on native MSX hardware itself. Simple surface level observations of graphics and sounds are not enough – a true assessment can require considerable computational (and even physical) investigation. The discarding of prominent effects such as sprite flicker and CRT glow from many of today's re-imaginings of 8-bit aesthetics shows how selective and subjective such a project is.

Nonetheless, it is equally interesting that a meaningful exploration of "8-bit" design can result from studying fake 8-bit software. *La-Mulana*'s lack of comprehensive platform fidelity hasn't affected its reputation in the slightest, even amongst hardcore, hobbyist MSX programmers, where there is a perception that *La-Mulana* is a better "MSX" game than many actual MSX games (present and past): "I do think it would be great if something just as good would be made for MSX" [13]. And the game's developers are similarly lauded for their well-balanced MSX color choices: "some good techniques can be found" in the graphics of *La-Mulana*, noting their superiority to the very game which inspired them, *Maze of Galious* – "the background of [*La-Mulana*] is usually dark'ish [sic], whereas [*Maze of Galious*'s] background is very colored. A single color sprite could do well as long as they show-up clearly in front of the background. It's why lots of MSX1 games have a black background: so that a single color sprite looks ok" [13].

Had the developers desired, *La-Mulana* could (with some modest changes) have been a native MSX game, as is *The Cure*. But unlike 8-bit homebrew programmers, the deep technical challenge of such a task was not their primary motivator. While they are unabashed fans of the MSX platform (by all accounts amongst its biggest), they were more concerned with making an aesthetic statement about technology and game design. Not to mention the severe distribution limitations of compiling your game for an 8-bit platform (this hasn't stopped impressive games such as the recent *Knight 'n' Grail*, a non-linear platform-adventure similar to *La-Mulana* but written natively for the Commodore64, from offering commercial distribution through a digital download store) [5]. The modern PC was simply a more appropriate target platform for their ultimate goals.

5. PLATFORM REMEDIATION

La-Mulana's 8-bit mimicking is a highly specific example of the broader phenomenon of technological remediation for aesthetic purposes – a strategy to which games are no stranger. As 3-D game technologies advanced in the mid-1990s (most notably on the PC and Sony's PlayStation console), graphics programmers looked for ways to bring an aura of "realism" to their images. One effect they often used was the "lens flare", the blinding white starbursts and concentric rings that form when an optical lens catches a bright light source. These were especially popular in leading titles with urban settings, like *Gran Turismo 3 A-Spec* (SCEA, 2001) and *Grand Theft Auto: Vice City* (Rockstar Games, 2002). For awhile, lens flares were the game graphics state of the art, part of the ecosystem, from the evaluative criteria of game reviewers to the selling points of third-party game engine licensers. The irony, of course, is that lens flares are the artifacts of curvature in physical optics, an old media signature injected

into the new for legitimization. A similar strategy can be seen in the artificial film grain layered onto the sci-fi role-playing game *Mass Effect* (Bioware, 2007). The allure of such effects emerges from the dialectic of Bolter and Grusin's "double logic of remediation": an ideal of immediacy – a perfectly, preternaturally sharp 3-D rendering on today's gaming hardware – mitigated by hypermediacy, the awareness and exploitation of a medium's artificiality. The unreality of one medium helps to make the other feel subjectively "real".

Remediation also happens "locally": as a medium evolves, its earlier stages begin to be remediated within it. The emphasis on legitimization or realism fades, and remediation drifts from a fallback to a conscious stylistic choice, a tactic for evoking and re-interpreting the medium's past, an expert vehicle for the homage, the parody, or the genre revival. This is where remediation meets retro. The technique is relatively new to gaming, but it is richly developed in other media like film and music. For example, in the film *Pleasantville* (Gary Ross, 1998), two present-day teenagers are transported into a black and white, suburban 1950s-style alternate reality. The monochrome presentation of the world evokes its mid-century American naïveté, and as viewers we understand this connection because of our familiarity with actual television shows of that period. The original, technical requirement of black and white film and broadcasting is long gone, but in our historical memory it is closely associated with the content it represented. The twin sociological and technological transitions of the past five decades become the backbone of the film's symbolism: as elements of 1990s modernism slowly seep into 1950s innocence, the world is literally colorized, one character, building, and flower at a time. *La-Mulana* extends this logic from film hardware to game hardware: it is an MSX *platform remediation*, and as we've seen, evocation through technological aesthetics is similarly central to its origins.

But in terms of both aesthetic presentation and formal ambitions, perhaps a more apt film comparison than *Pleasantville* would be avant-garde filmmaker Guy Maddin's *The Saddest Music in the World* (2003). Shot in a varying pastiche of early film tropes, including black and white (with some color sequences), heavy film grain, and fuzzy iris lens-induced edges, the plot centers on a bizarre musical competition set in 1930s Winnipeg, and "evokes Busby Berkeley musicals, silent melodramas and Depression-era studio fantasies of wealth, romance, and intrigue" [15]. Most notably, a shock of temporal displacement marks the critical reception of both *Saddest Music* and *La-Mulana*, with reviewers in each case expressing the disorienting (and undeniably striking) simultaneity of a technologically dated presentation paired with a contemporary sensibility:

> *La-Mulana*: "You get the feeling that the history of video games went awry about 20 years ago, and that *La-Mulana* somehow came to us through a wormhole from a beautiful parallel universe" [14].

> *Saddest Music*: "[S]eems to pop out of an otherworldly time capsule. It is a tribute to, and a sendup of, old movies that never quite existed.... delving into a past that never was to prophesy an alternative vision of the future of movies" [15].

That the retro mode created by the remediation of *La-Mulana* and *The Saddest Music in the World* is expressed in science fiction or mystical terms of "time travel" belies the degree to which we historicize the aesthetics of our technologies. This notion of

generative retro views the past neither reverently nor quaintly, but instead, as Elizabeth Guffey says, with an "unsentimental nostalgia" [2]. Retro is delineated from the more classical form of revivalism, which while taking great pleasure in the past nonetheless considered it from a detached perspective, as a "completed" protocol rather than as a still viable branch of evolution. This retro strategy is to mix up recognizable components of past aesthetic styles and genres, reassembling them into previously unseen forms.

From these examples, we see retro as a unique subset of artistic inspiration and influence: retro carries with it a source of *discontinuous* influence, resemblance coupled with temporal distance. This is distinct from the more generally incremental nature of game design, such as the step-by-step evolution of the "matching tile" puzzle game genre over more than 20 years, traced by Jesper Juul from *Chain Shot!* (Kuniaki Moribe, 1985), to *Dr. Mario* (Nintendo, 1990), to *Bejeweled* (PopCap Games, 2001) [4]. Retro media, on the other hand, is not that which innovates upon its direct parents, but rather those ancestors which are unequivocally "outdated". Of course, the determination of currency vs. obsolescence is itself imprecise and up for debate. But broadly speaking, creative industries that are structured upon cyclical change have a particular predilection to retro as phenomenon and rhetoric. This is no doubt why fashion was at the center of the term's establishment by 1970s French critics [2]. Gaming hardware may not be quite as pliable as fabrics and colors, but the break-neck leapfrogging of technology and periodic turnover of game consoles provides a built-in obsolescence that almost guarantees the emergence of retro gaming. The aesthetic potential of a game platform is only beginning to be understood by the time it is discontinued commercially.

6. CONCLUSION: *LA-MULANA* COMES TO WIIWARE

A fascinating turn of events is that *La-Mulana*, an amateur-made game with a strong cult following, is now being remade for Nintendo's WiiWare downloadable game service – but with a change that goes to its core: the graphics are being re-drawn (and the sound re-composed) *without* the 8-bit constraints, in a higher resolution and full 32-bit color palette that matches current 2-D technology. From a theoretical perspective, one of the most intriguing aspects of the original *La-Mulana* is the way in which its 8-bit MSX platform remediation turns what usually passes for "retro" in commercial gaming inside-out: it has been neither the simple re-publishing or emulation of older titles that we find on Nintendo's own Virtual Console on the one hand, nor the re-packaged, graphically updated games often seen on Microsoft's Xbox Live Arcade on the other (the re-drawn *Prince of Persia Classic* serves as an example and effective analog to *La-Mulana*). The former embraces 8-bit aesthetics but only addresses them as past historical phenomena; the latter attitude implies (at least a bias) that we're better off without them. What has been particularly distinctive about *La-Mulana*'s brand of nostalgia is the way it has challenged this commercial conservatism, shifting the focus from specific game content – recognizable characters, trademark game mechanics, worlds, or storylines – to the more abstract concept of platform-centric nostalgia. To be fair, there are also encouraging signs that the industry is broadening its own views: *Game Center CX*, *Mega Man 9*, and *Pole's Adventure* are all examples of inventive, faux 8-bit games that use many of the

same techniques. It's also possible that *La-Mulana*, which predates each of these by three years or more, may have helped to inspired them.

Figure 7. In the WiiWare version of *La-Mulana*, the graphics are re-drawn without the "8-bit" constraints.

So there is no small irony that in joining the ranks of the commercial world, *La-Mulana* is doubling back on itself, undergoing its own "retro remake". That is not to say that *La-Mulana*'s "effectiveness" or success as either a piece of art or an enjoyable video game must suffer when it is re-incarnated on WiiWare. Nor are there signs of anything but enthusiasm from the game's developers, who appear re-invigorated at the opportunity to return to their work anew (*La-Mulana* was their first project together, and is now four years old). A telling comment about the forthcoming version comes from The Independent Gaming Source, which has tirelessly raised awareness of the original game: "less alienating graphics wouldn't be a bad idea" [6]. The game's MSX-styled visuals have always engendered a divided response from players, and for all those who appreciate its 8-bit pedigree, many simply find them too arcane to be comfortable. Some of the "8-bit" gameplay elements, such as the scrolling transitions between discrete rooms, may lose their coherence and context when the associative graphical waypoints are removed. But *La-Mulana* has always been something of a "time warp", and I suspect its re-configured patchwork of styles will bring its 8-bit influence and design philosophy of contemplative difficulty to a wider audience – it may simply induce a different form of disorientation when presented primarily as a "contemporary" game.

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