

Design Patterns in Games: the case for Sound Design

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ABSTRACT

We present results of an initiative to express expertise in sound design in games as design patterns, aiming at the empowerment of non-expert practitioners and at the creation of the conditions for the broad community of game developers to invite expert sound designers more regularly and earlier into game projects.

We describe how we have harvested the patterns by analysing the experts' works as a more convenient alternative to directly eliciting knowledge from them.

We also reveal how we tackled the synthesis of such guidance in a way that it embeds a holistic approach to the exploration of sound, with consequences beyond the mere sensitization to its pertinence.

Finally we present a Deck of Cards and a Wiki as companion tools for the proposed Pattern Language for Sound Design in Games.

Keywords

Deck, design patterns, design cards, game design, pattern language, sound design.

1. INTRODUCTION

Currently, expertise in sound design in games is mostly tacit and held by senior professionals, who are not numerous and who typically work for resourceful teams that are able to afford them [32, 37]. Indie game developers, usually working with low resources, often have to cope with lack of expertise in sound design [31].

Also, sound design professionals frequently report their struggle to let other stakeholders realize that the practice – and results – of sound design suffer from being left to a phase of the development cycle when there is no longer room to fit explorations that might take full advantage of the potentialities of sound [19, 20, 22, 23, 28, 32, 33, 35]. As a consequence, instead of actual sound *design*, these professionals are often left with few more to contribute besides the mere sonification of the game.

This set of realizations led us to work on a proposal that aims at providing guidance for the empowerment of non-expert practitioners to perform sound design in games, hence being able to take full advantage of the potential of sound in their projects.

The goal of such an empowerment is twofold. First, it should enable non-experts to *perform* sound design on their own, in scenarios where having an expert sound designer is not an option. This goal serves, in particular, the mass of indie game developers mostly working in small and low budget teams. Second, and thinking of the broader community of game designers, empowerment in sound design should also come from leveraging the literacy in this specific domain. In addition to augmenting the *awareness* for potential contributions of sound to the overall product design, this should provide the abilities to *communicate* and to more actively *participate* in the conception of possible explorations. In turn, this awareness may create the conditions for expert sound designers to be invited more regularly and earlier into game projects.

Our first approach consisted of an initial set of seven Guidelines for Sound Design in Games [6]. The experimentation with the guidelines led us to realize that although the practitioners revealed to understand and to be sympathetic with the inscribed recommendations, this level of guidance was not particularly effective in terms of generating specific ideas to feed the creative process. We interpreted this as being related to the high level of abstraction of this form of guidance, which did not provide beginners with an expedite and tangible enough way to propel the design specification.

We conjectured that a complementary lower level of guidance might augment the effectiveness of the approach. The formalism of *Pattern Languages* [4, 5] emerged as a possible match for such a requirement. Pattern languages have proved favourable in disparate domains with comparable concerns of empowerment of non-expert practitioners to access the body of knowledge and progressively participate on novel solutions. One other precious advantage of pattern languages, and respective design patterns, is that they are prone to promote the dissemination of the *vocabulary* of the domain also with positive repercussions in the communication among experts and non-experts. Additionally, pattern languages offer the conditions for the authorship of the body of knowledge to be transferred and continuously updated by the community of practice, which not only contributes to the desired appropriation but also provides the support for the longevity of the project.

Being so, we set ourselves the challenge of building the foundations for a pattern language for sound design in games. In the next section we present a literature review of related endeavours. Then, in Section 3, we present the methodology we adopted and, in Section 4, our results. In Section 5, we add some reflections and, in Section 6, we refer to boundaries and limitations of the proposal.

2. RELATED WORK

In this section we present a brief overview of related work, namely in terms of pattern languages that have been proposed for game or sound domain.

Regarding game design in particular, Kreimeier [30] suggested the pertinence of a pattern language aiming at “establishing a formal means of describing, sharing and expanding knowledge” [30, para. 3]. He referred to the *Formal Abstract Design Tools* [21] and to the *400 Design Rules* [11, 12, 24] as close groundwork, and he provided some candidate patterns. A pattern language for game design with over 200 patterns was proposed [16, 27] and later published in book form [14].

Björk and Holopainen’s [14] patterns are grouped in categories such as *Game Elements*, *Resource and Resource Management*, *Information*, *Communications and presentation*, etc. These categories are further divided in subcategories; e.g., *Game Elements* is divided in *Game Worlds*, *Objects*, *Abstract Objects* and *Locations*. Examples of patterns in the category *Objects*, for instance, are *Boss Monsters*, which are used to structure the progress of the game [14, p.73], and *Pick-Ups*, which are elements designed for players to collect and which may serve several purposes [14, p. 87].

Hullett and Whitehead [29] presented patterns for the specific case of designing levels in first-person shooter games. Their goal relates to the fact that “there is no accepted common language for describing the building blocks of level design and the gameplay” and that “there is little formal understanding of [that] process, but rather a large body of design lore and rules of thumb” [29, p. 78]. The patterns are grouped in four categories: patterns for *Positional Advantage*, *Large-scale Combat*, *Alternate Gameplay*, and *Alternate Routes*. An example of a pattern, from the former group, is the *Sniper Location*, which demands particular thoughtfulness from the designer. Another example, from the latter group, are the *Hidden Areas* that are usually designed to be off the main route for rewarding players for exploration.

Regarding pattern languages addressing sound, or even just circumstantially referring to sound, examples are rare. Borchers [17] presented a musical pattern language. This is part of a pattern-based approach consisting of three patterns languages: the first for the application domain, namely for designing and performing pieces of blues music; the second for the human-computer interaction for interactive exhibits; and the third for designing the respective software. Two examples of patterns from the musical pattern language are, the use of the *Pentatonic Scale* to address improvisation [17, p. 93], and the choice of complementary notes – *Blues Notes* – to add tension to the pentatonic scale [17, p. 95].

Barrass [10] wrote a group of design patterns for sonification founded on the idea of “functional sounds where the Bauhaus principle that ‘form should follow function’ is particularly apt” [10, p. 174]. He based those patterns on the analysis of a selection of papers presented to the ICAD Conference in the preceding year. Later he was involved in adding 6 new candidate patterns for auditory displays [3]. Examples of these patterns are *SonifiedLineGraph*, which addresses the design of audio-only representations of two-dimensional data sets; and *SystemMonitoring*, which deals with the problem of enabling users to monitor an activity even while engaged in other activities.

Frauenberger [25] presented an approach, based on patterns, to the design of auditory displays, i.e., to “the design of audio for feedback in human-technology interaction”. His contribution

includes “a framework providing methods to capture, apply and refine design knowledge through patterns”, which he calls *paco*, and which “serves as the organizing principle for patterns, artefacts and design problems and supports designers in conceptualizing the design space” [25, p. 3]. Examples of design patterns created in that way include a *Virtual Geiger Counter* to deal with the fact that multivariate and time-varying data are hard to show and understand visually, and the *Overview of Graphs* which presents a solution for providing a quick auditory perception of graphs when they are not visually presented.

3. METHODOLOGY

Our methodology to synthesize the design patterns was influenced by a literature review, testimonies from field protagonists including respected practitioners, critics and reviewers (often through informal channels), and information posted in disparate game forums. Yet, the main methodology consisted of an iterative process of systematic exploration of a multitude of games and on the subsequent phases of processing the recorded gameplay video, along which we identified candidate patterns and extracted the respective instances of recurrent sound design explorations with the intent of presenting them as pattern examples.

The adoption of this *harvesting* technique is in turn grounded in the realization that expertise in this domain is predominantly *tacitly* held by experts, and that methodically inquiring these agents about their know-how would be impractical. Being so, we embraced the approach of observing the experts’ work and resynthesizing patterns based on evidences of application of their expertise. Such approach has proven to be interesting in other contexts facing similar challenges [14, 15, 16].

This approach became a major characteristic of our methodology, namely because we realized that, in order to properly apprehend the contribution of sound design to the players’ experience, we should actually behave like players. As such, we opted for playing the games ourselves, as opposite to observing others playing either live or through videos of their gameplay sessions. Aarseth [1], referring to methodological approaches to game analysis, actually puts “playing the game ourselves” as the preferred method for acquiring knowledge about the qualities of gameplay and, through that, of the effectiveness of design. He considers such approach better than, e.g., talking with the developers of the game, or observing others playing, or reading their reports and reviews. He adds to the argument that “unlike studies of films and literature, merely observing the action will not put us in the role of the audience” and that “what takes place on the screen is only partly representative of what the player experiences” [1, p. 3]. Other authors present complementary arguments to the importance of “playing lots of games” [18, p. 9], including to the enrichment of one’s vocabulary and to better supporting ideation [2, p. 66].

Also, as players, we developed privileged conditions to participate and appreciate discussions with and among other players. This allowed us to expand our perspectives, inclusively in the analysis of our own experiences. More influentially, such discussions often provided us with clues on promising games and specific interesting sound explorations, through informal sharing along time. So, although the design patterns and respective examples that we propose represent our harvesting, they also embed other people’s acquaintances.

Since the initial phases, we felt the need to maintain our observations and prospective notes in ways that enabled the representation of their *relationships*. In Figure 1, we exhibit a

detail on an intermediary state of one of the maps that we used to hold hints and findings during prospection. The graph depicted in the background is the ancestor of the network we will show in Figure 2.

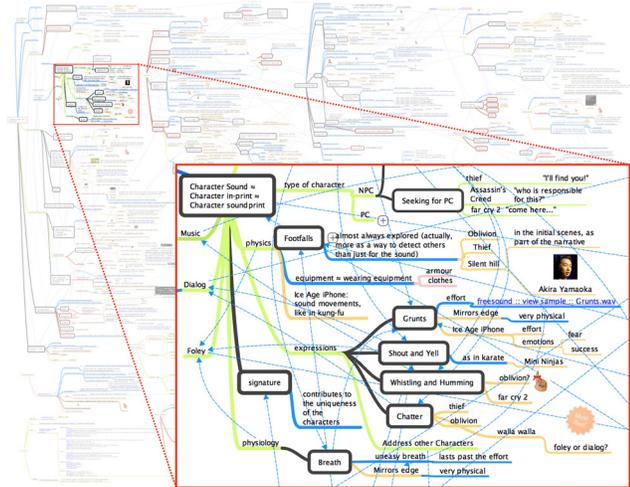


Figure 1. Detail of a working version of one of the mind maps that we used to register observations

3.1 Game selection

The amount and assortment of games we felt the need to experiment with was determined by the evolution of the contribution that each additional experimentation was having to: a) the building of the collection of patterns; b) the delineation of the relationships among those pattern; and c) the identification of distinct specific explorations that might exemplify different applications of the concept inherent to each pattern.

We observed a sustained production of samples with potential research interest throughout the experimentation with a considerable number of games before we considered that it would be reasonable a pause in this component of the study. To exemplify the dynamics of this phase, it is worth noticing that, not infrequently, it happened that we came to realize, retrospectively, that a game we had already played included a certain exploration that we were meanwhile identifying in the course of the experimentation with another game. In the same vein, when revisiting a game (for some reason), sometimes we end up realizing the existence of examples of exploration of certain patterns which passed unnoticed in a former session. Several reasons may explain this phenomenon, including the fact that the latter experiments might indeed exhibit a more comprehensive exploration of the pattern, or because only after the earlier experimentation we came to identify the pattern at stake.

Moreover, it is important to recognize that a pattern, by definition, implies recurrence [39]. So, at least theoretically, it should not be surprising that only after experiencing several times a certain exploration the underlying pattern became noticeable to our conscious appreciation.

The games were thoughtfully selected according to how promising they were in terms of sound design, either globally or in respect to some specific exploration that we had learned they would include. To augment the effectiveness of the primary identification of games with interest to this research we considered online commentary (e.g. reviews), relevant awards, and precious hints from fellows with educated appreciation for videogame culture. We tried to be inclusive, in terms of game

genre, platforms, context of development (e.g., mainstream, indie, experimental), public recognition (blockbusters, cult games), etc. To date, we have extracted relevant examples of design patterns from more than 100 games [9].

3.2 Evolution of the pattern format

In this subsection we present the format that we refined for specifying the design patterns, represented in Table 1. It results from gradual adjustments, along versions of the Pattern Language.

Table 1. Current pattern format

Field	Type of contents
Name	One or very few words
Synopsis	Shortest possible description
Relationships	Categorized list
Description	Description
Examples	Video clips with descriptions
Additional Comments	Description
External Resources	Commented list
References	List
Revisions	List
Confidence Level	Expression

We paid great attention to each pattern's Name, since it is one of its most sensitive and strategic aspects [26, pp. 3, 6]. Ultimately, the name of the pattern will be the expression to enter in the practitioners' vocabulary [17, p. 65], [36, p. 565].

We opted to orient names towards the solutions that the respective patterns provide (as Borchers [17, p. 65]). Whenever serving several possible contexts of use, the solution may be communicated through the specific approach (e.g. Grunts, Recordings, Music). When the solution is tailored to a specific context of use, we preferred adopting such context as the pattern's name, since it is more revealing and the solution is tacitly associated to it (e.g., Achievement, Window of Opportunity, Imminent Death, Cutsscenes).

We also value shortness, in names. For instance, a name should be an expression that people are able to integrate in everyday discourse without feeling the need to create a smaller variant. Most of our pattern names are constituted by 1 or 2 words, being the maximum 4 words (which is in accordance with Borchers [17, p. 65]).

We use a Synopsis as the shortest possible sentence that identifies each pattern's contents. This can also be thought as an extended version of the name. In terms of number of characters of the synopses, the median is 47 and the mean is 47.7.

In many cases, we opted for an approach that reveals the solution in context. Still, per-case adaptations, were needed. The span of application of the pattern, for instance, influences how much the synopsis is able to reveal. For example, the synopsis for Eavesdropping exposes some detail: "Adopting behaviours with the intention of gaining knowledge by listening to others' conversations". In turn, the synopsis for Sound Input is more wide-ranging: "The way sound enters the game world".

Coherently to what we also adopted regarding the names of the patterns, we avoided the replication of the introduction "The contribution of sound..." in every synopsis, unless we understood it would clearly enhance the message. As such, for instance, "Signalling something positive" (in Achievement) should mean "The contribution of sound in signalling something positive". We

believe this is a reasonable compromise, considering the context and our holistic approach to sound design.

The field *Relationships* is the one whose changes more pronouncedly reflect the evolution of our adopted format through the endeavour: it is a categorized list of other patterns with which the pattern relates to. We found this preferable to a prose-like exposition of the relationships. Furthermore, we experienced overload while trying to isolate the narrative description of the relationships from the description of, for instance, the solution. Having a separate description for the relationships was often leading either to redundancy or to unnatural cuts. Consequently, we decided to migrate and embed the *description* of the relationships with the description of other aspects of the pattern, into what is now the field *Description*.

For the categorization of the list in *Relationships*, we distilled a set of labels, along time, which offer a balance between detail and manageability. Typically, while specifying the *Relationships* of a pattern, a suitable subset of those labels is used, e.g., *Context*, *May relate to*, *Differs from*, and *Makes use of*. The wording in the labels tries to reflect the choice of words that would occur in a natural sentence, where the relationship would be explained.

In most of the patterns, the representation of the relationships involves 2 or 3 categories (65% in conjunction), though such amount ranges from 1 to 5 categories. The amount of relationships per pattern varies from 1 to 16, totalling 572 expressions of relationship for the 81 patterns (version 2.0). The median is 6 relationships per pattern and the mean is 7.1.

A depiction of the complete network of relationships will be presented in Figure 2. In that representation the nature of the relationships is colour coded in a simplified way, for the sake of perceptiveness: blue arrows represent “hierarchical” dependencies, e.g., *Context* and *May use*; green represent “non-hierarchical” dependencies, e.g., *Relates to*; magenta applies to particular cases of high proximity, e.g. *Peers*, *Close to*; and red represents difference or conflict, e.g. *Differs from*, *Compromises with*.

We ceased to have an explicit field dedicated to the *Context* as it is common finding in pattern templates. Usually, a *Context* field is included to refer to “what is above” (thinking in terms of hierarchical levels of abstraction) or what calls for a certain exploration (thinking in terms of development flow) (e.g., Borchers [17, p. 52]). Our experience with the synthesis of the patterns led us to express those kinds of connections as part of *Relationships*. The description of the relationships referring to context is then presented together (*in context*) with the description of all other relationships.

So, the field *Description* is where the contents of the pattern are explained. This field intertwines, as convenient to the discourse, the kind of information that commonly expressed in fields such as *Context*, *Problem*, *Solution* and *Relationships*. *Problem* and *Solution* were fields that we also decided to abandon. We did not find efficient to isolate the description of the context, problem and solution and (other) relationships in separate fields. We noticed that considerable effort was being dedicated to that encapsulation, and the resulting exposition was often impaired either by replication due to the need of indexing aspects in one field to disparate aspects in another field, or by the abnormal cuts in the reasoning. The adoption of a field accommodating free text, although theoretically may require some more discipline from the author, in order not to leave important aspects uncovered, allows a better articulation of the pieces of information being presented.

Examples consists of video clips accompanied by a description referring to the particularities of the respective solution. These specific descriptions are very important because they allow the branching – and specialization – of the common solution presented in the field *Description*. We will reveal more details about the included examples, later in this paper.

The remaining fields simply contain what their names announce: *External Resources* redirects the users elsewhere; *References* follows a typical academic style; *Revisions* keeps a log of revisions; *Confidence Level* is typical to patterns, though we are not yet taking advantage of it.

4. RESULTS

In the following subsections, we expose prominent aspects emerging from this research. These include the holistic nature of the synthesised patterns, a characterization of the Pattern Language, and supporting tools: a Deck of Cards and a Wiki.

4.1 A holistic approach to sound design in games

Our proposal is characterized by an operative adherence to a holistic practice of sound design, embedded in game design, in which the exploration of sound is meant to be performed in the early phases of ideation and addressed by its purposefulness to the game experience.

Our mindfulness for a holistic approach to sound design stems from thoughts expressed by expert sound designers and it finds a solid theoretical support on the body of knowledge in the field of Acoustic Ecology [34]. This mindfulness has been influential to our study since our early developments and, in fact, it also became a trait of our methodology. Still, we were uneasy, in those early phases, with the idea that for non-expert practitioners to profit from a holistic sound design they would depend on keeping such mindset in their minds while preserving to find ways to explore it. We sensed that, despite the sympathy that these practitioners might grow regarding the holistic approach, sensitization alone might not be effective enough in supporting significant change.

It was when we could eventually realize how that holism should materialize, in terms of the kind of guidance that we were developing, that it really became consequential. We were able to design our proposal in a way that is not limited to the acknowledgement and reverberation of the pertinence of such understanding: the understanding is really implemented *through* the proposed guidance. Thus, for this holism to be achieved, designers are less dependent on their ability to sustain the mindset or to be attentive to some other additional layer of concern. Instead, if designers will consider the proposed guidance in the ideation process, they will be in fact considering sound in a way that is holistic, based on suggested explorations that are also holistic *by design*.

We found that a way to accomplish such effect is to embrace the *purpose* of the sound explorations, as opposite to what is heard, not only while harvesting but also when documenting and choosing the names for the patterns. That is why the proposed patterns grasp the contexts of use together with the explorations of sound. Indeed, what we harvested, in most of the patterns is a context of use of sound, accompanied by distinctive examples of its operationalization. For instance, the pattern *Imminent Death* represents a gameplay situation, and its identification does not explicitly mention the use of sound. The *examples* included with the pattern are the ones that put to evidence the instrumentality of the exploration of sound in serving such a delicate moment of the

gameplay. We would come to find evidences, later in the research, that this approach not only addresses sound design in a holistic way, but also can be used as a creativity instrument for *game* design – namely game design sensitive to the exploration of sound.

4.2 The Pattern Language

In its current state, version 2.0, the Pattern Language consists of a network of 81 design patterns. A depiction of the complete network of relationships may be observed in Figure 2. The design patterns are publicly available through a wiki, *soundingames.com*, where it is possible to check examples of their occurrence.

The examples supporting a pattern are a core element of its presentation. Ultimately, it is through the examples that users understand the plausibility of that pattern. Also, the examples provide the most direct means to expose the solutions currently adopted for the exploration at stake.

The examples that we have been gathering are presented as short movie pieces, with less than 30 seconds, trimmed from video that has been recorded during game playing sessions. Among other aspects, this length should allow quickly focusing on the particular aspect at stake, and possibly checking several examples without compromising the flow of the design task being performed. Thinking of scenarios in which the videos are offered online, this also reduces the network bandwidth demand. Moreover, 30 seconds is a commonly used limit for video media quotation without infringing on Intellectual Property regulations.

Currently, we have a database of more than 600 unique video examples, which means an average of more than 7 examples per

pattern. If we also consider variants, e.g., distinct examples of a pattern found in the same game, then we actually have more than 900 examples.

Together, the specificities of the disparate examples should emphasize *diversity* of opportunities, as opposed to biasing or influencing into a particular solution and consequently, constraining creativity. It is also most plausible that diversity contributes for users to better grasp the core of the concept and hopefully to provide insights to *innovative* solutions. Though we still need to further study this correlation, we now have favourable conditions to do it.

4.3 A Deck of Cards for Sound Design in Games

During the process of refining and growing the Pattern Language for Sound Design in Games, we found the interest in conceiving a representation of the patterns, alternative to the customary referential support in text forms, suitable for expediting and sustaining the interface between the practitioners and the patterns during an actual design exercise. The preliminary purpose of such representation was to allow *auditing* game design exercises influenced by the Pattern Language, aiming at the detection of hindrances and opportunities to evolve the language, and the evaluation of its usefulness for the practice of sound design in games.

We conjectured that a *deck of physical cards* could serve both the research intent and the practice of design [7, 8]. Practitioners might appreciate a presentation of potential sound explorations in a format that is literally handy, and researchers, willing to test and

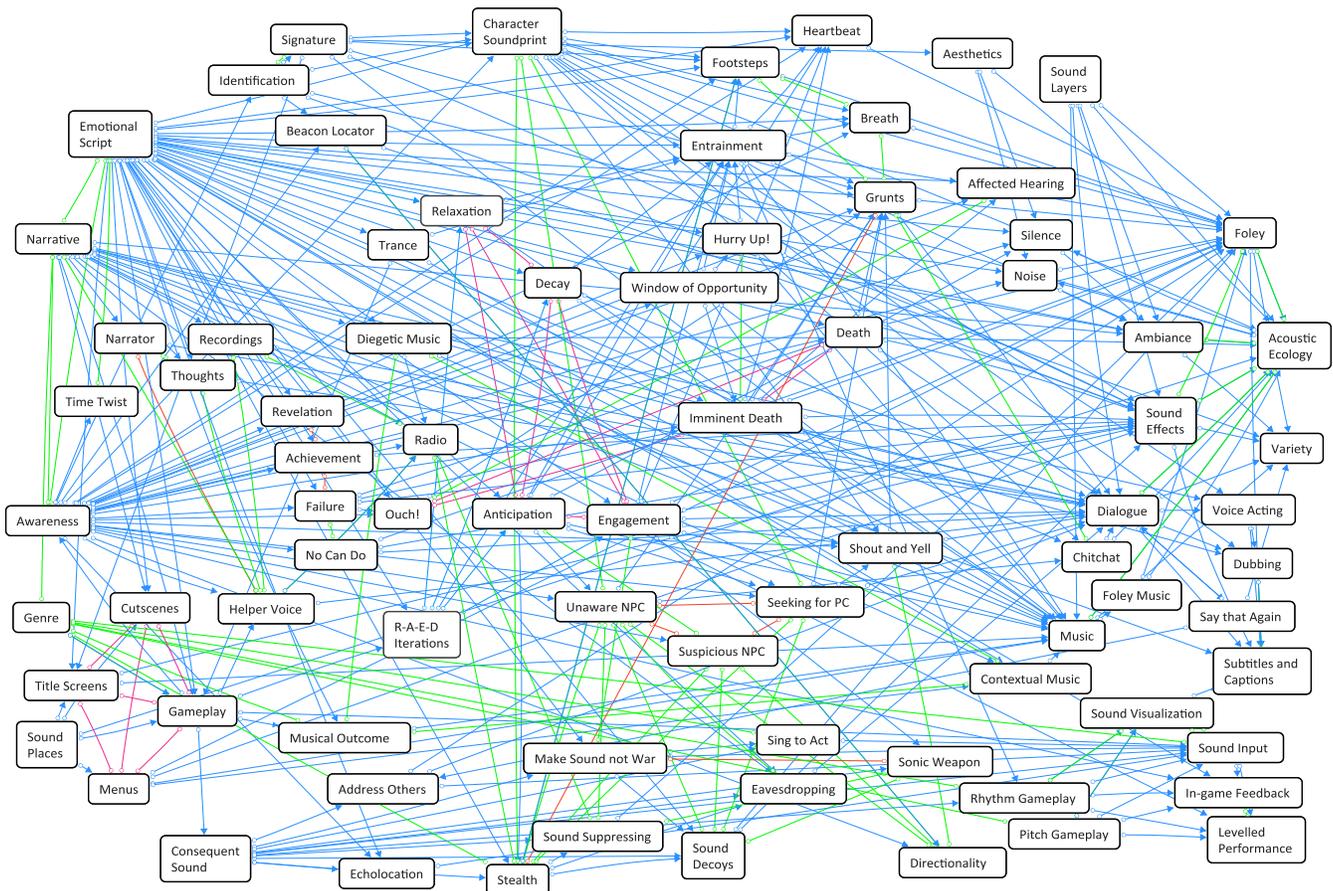


Figure 2. Network of sound design patterns as defined by their relationships (version 2.0)

evolve the proposed patterns, might explore the usage of cards as part of a setting designed to enhance auditability of the design phenomena.

While developing this Deck, we started to realize its potential beyond the initial phases of development of the Pattern Language and the formerly envisaged research goals. Namely, we found that the way the Deck was being implemented opened up the opportunity for it to become a consistent means to communicate the body of knowledge, and that its support to the setting prepared for those initial phases constitutes a possible approach to the practice of sound design. So, eventually, the interest in the Deck was assumedly extended to also encompass those, more general, purposes: dissemination and end-user design tool.

The resulting cards are 86x112mm and double faced, as exemplified in Figure 3 [8]. Their content maps the corresponding patterns' fields but they were designed so that users are not requested to be familiar with the formalism of Pattern Languages.

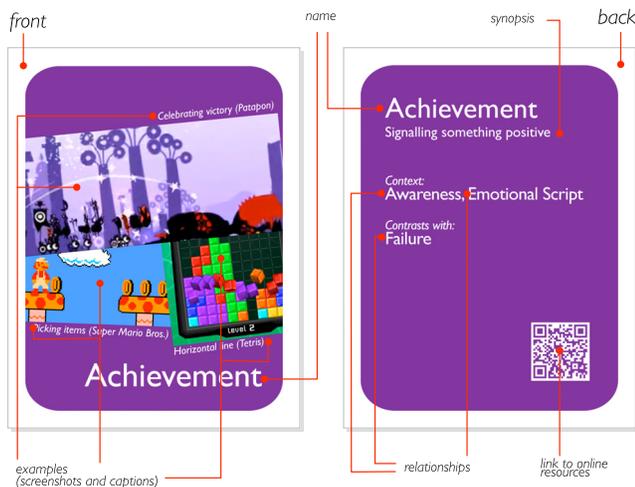


Figure 3. Card Layout (exemplified with “Achievement” card, scaled 45%)

The observations we made through experimentation gave us indicators that the proposed guidance can empower non-expert practitioners [7]. The results were very encouraging and allowed us to gain confidence on the Pattern Language and on the Deck as a tool to assist sound design in game design.

4.4 A Wiki for the Pattern Language

The systematization of knowledge on the Wiki is a strategic piece regarding past and future goals of this project. Its contribution may be presented along three dimensions: *a)* structuration role of the Wiki on the development of the Pattern Language; *b)* participation on the dissemination of the inscribed contents; *c)* support for openness to contributions from the community of practice.

Besides its instrumentality to the development of the Pattern Language, i.e., as a piece of our research methodology, the Wiki also serves the purpose of providing the audience with guidance to perform sound design in games, namely through the presentation and learning of such language. In that sense, the Wiki, as a means, is also an important contributor to such a dimension in achieving our research goals.

The Wiki also contributes to the dissemination of the proposed Pattern Language by supporting the Deck of Cards. The Wiki's relation to the Deck is twofold. First, it exposes and makes the

Deck available to a larger audience. Second, it assists the users of the (physical) Deck by providing them webpages and resources that are fit to the design calls, namely when accessing through the QR-Codes contained in the cards. This assistance is meant to be as directed as possible and to afford exploration during game design sessions. Virtual representations of the cards are also embedded in the respective patterns' webpages with the double purpose of presenting and extending the use of the physical cards. Several aspects in the interface such as the ability to flip a card, picking a random card, and having a peek at a related card, are meant to better bridge both planes of existence. The wiki also serves to make available a PDF file specially prepared to be printed in order to create a physical Deck.

The third dimension of contributions to be achieved through the Wiki relates to the openness to the community of practice. We believe that the choice of a *wiki* platform itself is also important to *tacitly* signal our attitude towards the contents. Namely, due to the typical usage of wikis, we expect to be easier for us to convince visitors that this website is an open platform. In that sense, choosing a wiki became economical in terms of characterizing our website to visitors; or putting it in even another way, this kind of platform provides an already culturally established *context* that we otherwise would have to, somehow, communicate more explicitly. In turn, the perception of openness may contribute to foster a positive emotional appreciation for the endeavour, even by those not contributing directly.

5. REFLECTIONS

In the following subsections we add some reflections. We start by clarifying that we do not imply any correlation between the quantity of sound design patterns being applied in a project and the quality of the resulting sound design. Then, we refer to the definition of a strategy for opening the Wiki to the community.

5.1 The pattern collection is *not* a checklist

It is of paramount importance that we make clear that the collection of patterns is meant to provide the designers with the opportunity to consider *possible* explorations that may (or may not) help them in achieving their design purposes. By no means do we intend to suggest that a good sound design would depend on the exploration of “many” patterns, less to say all of them. The *quantity* of explored patterns is not an indicator of the *quality* of sound design. The quality of sound design depends on the merit of each of the designed explorations in context, not on their number. Actually, not even the *extent* of sound exploration depends on the number of adopted patterns and, more relevantly, excess of explorations can be as damaging as the lack of them.

Moreover, a judicious selection of the design patterns to explore, according to the specificities of an application context, is not even an appeal that is particular of our project. It is a feature of the formalism of pattern languages itself (e.g., [38, p. xxi]).

In the same vein, a large number of available patterns must only be understood as a large space of opportunities. Again, the idea inherent to the patterns is to reveal possibilities for the practitioners to consider in each particular project, not to induce those practitioners to check that the patterns are used.

In fact, we don't even advocate that, *in practice*, a larger number of available patterns – i.e., supposedly, of more opportunities – is better than a smaller number. For instance, depending on how the patterns are used at design time, the number of available patterns may correlate to the level of attention paid to each particular pattern.

5.2 Defining a strategy for opening the Wiki to the community

Our investment in several aspects of the already conducted research was assumedly part of a strategy to reach the community's interest. For instance, as stated before, we considered relevant to extend the harvesting of new patterns and of examples for already existing patterns, while we perceived we were still being productive and genuine in that task. Such decision relates precisely to the fact that we found it strategic to come to a satisfactory representation of a network of design patterns, capable of nurturing the interest of the community on the overall proposal, and working as a convincing debut for an open discussion.

Opening the Wiki to the public, and promoting it, is a mandatory step in the continuation of this project. The native features and the extensions available to the wiki platform ensure the basis for expediting collaborative editing and social interaction, but the matter is far more complex than the strict technical ability to do so. It implies the establishment of a clear participation and dissemination strategy that involves addressing several sensitive issues, including the forms of contribution, the criteria for acceptance of contributions, the scope of revision, and our own role thereafter.

6. BOUNDARIES AND LIMITATIONS

Most of the sound explorations that we suggest imply an adequate level of flexibility to design the game in ways that allow such explorations to be possible and meaningful. Hence, many explorations might be ruled out if the sound design guidance is to be used in a project whose game design is already closed or otherwise locked. Although we do not consider this to be a flaw intrinsic to the design guidance, in the sense that it is a direct consequence of one of the virtues that we built in it, it certainly dictates that our proposal will not be as effective in all possible scenarios.

Nevertheless, this aspect, though limiting, is not as critical as it may seem in a first appreciation. To start with, it is unlikely that games that are already implemented will get back to the development phase, to be reedited, for instance to have their sound redesigned; so, our concern should in fact converge to game projects that are *yet* to be implemented. In turn, in this latter scenario, provided that the interested users contact with the sound design guidance before they actually engage in game design, they will likely be aware that this guidance is meant to be used during the process of ideation.

Still, we recognize that users may decide *not* to use this guidance during the ideation phase, for instance because they already have an established workflow for that phase and they don't find a way to combine them. That is one other kind of limitation: the guidance we are proposing, and particularly its instrumental level, e.g., the Deck of Cards, may not fit in, or call for disparate approaches, in case the designers are willing to concurrently use other mechanisms or workflows that somehow conflict with its usage. This issue is related to an aspect that we are addressing as future work, which is the definition of a *process* for the use of the guidance that we are proposing. Some authors suggested settings where methods are combined [13, p. 18], which may be relevant to inform a resolution on specific scenarios.

7. CONCLUSION

In the scope of a broader study, we have been proposing guidance for the empowerment of non-expert practitioners to perform sound

design in games, assuming the impracticality of integrating sound design experts in their teams. This empowerment also implies leveraging the literacy in this specific domain, hence providing abilities to communicate and participate in the conception of possible explorations. Such abilities could also be beneficial to the broader audience of game developers, where it could create the conditions for expert sound designers to be invited more regularly and earlier into game projects.

We propose a Pattern Language that provides tangible suggestions of exploration representing recurrent design solutions that can be found in existing games. We opted to harvest such solutions, as a more convenient alternative to directly eliciting knowledge from the experts, which revealed itself to be feasible and prolific at this phase of the endeavour. We backed up the Pattern Language with an extensive library of judiciously selected examples, which reinforces the pertinence and semantics of the proposals, augments the likelihood that the patterns are well understood, signals diversity of opportunities when implementing a pattern, and supports designer discourse and creativity.

We deliberately invested in augmenting the plausibility of this initiative to become noteworthy and attractive to the community – a requirement for further engagement and eventual appropriation – by growing a meaningful body of knowledge that can be regarded as a worthy starting point. For instance, we expect that these conditions entice early participants to get involved in commenting on pieces of the already proposed body of knowledge, instead of requiring them, at this debuting stage, to fill in their own contents and then expect others to comment on it. That latter dynamics, though closer to a full appropriation of the body of knowledge, will possibly start emerging only when a sense of community will already be perceptible. Furthermore, it is conceivable that some profiles of contribution will, precisely, consist of (mostly) commenting; so, the sooner we manage to engage such protagonists in dialogue the better.

We also designed a Deck of Cards whose initial motivation was to facilitate the auditing of design sessions, with research intents. Soon, this Deck revealed the potential to become a more general-purpose tool for the community, as a support to the communication of the body of knowledge and to the practice of design.

Additionally, we have been developing a Wiki. The Wiki is a tool thoughtfully designed to support the empowerment of the target audience, allowing the exploration and the eventual appropriation of the body of knowledge. As part of this role, it also works as the repository of the library of video examples, and it backs up the use of the Deck of Cards. The Wiki also contributed as an ongoing *research* tool. It has been instrumental in incrementally building and revising the structure of relationships in the Pattern Language. Plus, it offers the technical conditions to participate in the maturation of this form of guidance by supporting the continued engagement of relevant stakeholders.

The Pattern Language, and the Deck, have been improved through the analysis of exercises [7, 8], which were most fruitful not only in terms of the intended revisions but also for the maturation of our understanding of this form of guidance and of its integration in a game design scenario.

This endeavour has been prolific in presenting further opportunities of research and development, which we are pursuing. Our most immediate venture will be to publicly release the Pattern Language to the community of practice. We are confident that the adoption of the Wiki will favour this step, both technically and regarding the predisposition of the audience to

recognize and embrace it as a social tool. We are detailing a strategy and tuning the technical features to open the Wiki to distributed intervention. Concurrently, we are promoting and studying further cases of use of the guidance in game design, occurring in diverse conditions.

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