DESIGN DNA APPROACH FOR DEFINING “STYLES”.

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Abstract

Artists with a “style”, can produce works with similar feelings; works of an experienced artist have shared values; there is an imprint; a repeating sensetion that could be observed, this is because they share a similar Design DNA (DDNA) with slight variations. Like our DNA defines us, the Design DNA (DDNA) defines an object's (or an artwork's) characteristics. Here, we are trying to come up with is a methodology to define this "Style", so that "Style" could be teached., therefore we come up with the DDNA concept. In a glimpse, the DDNA are consistent set of rules that defines a particular style. DDNA is composed of metametadata that defines the "Style" of an artist in great detail, it could even be used to define the "Style" of Art Movements, Cultures etc. The paper starts with the description of DDNA and follows with details on how to derive the DDNA from objects, cultures and artists, to create and recreate the DDNA, and how DDNA could be used to develop and identification of new styles. The paper concludes by demonstrating an "artificially" created artist with her unique style, which is essentially simulated by the computer; so even if the artist ceases to exist, the computer can carry the soul of the artist for creating new works, in the style of the artist, because computer has the (Generative Design DNA) GDDNA of the artist. The DDNA is great as it could be used to teach how to develop “Style” in Arts and Design education, and it could be used in an industry to create products that have the “style” of an artist.

Keywords - Design DNA, Style, Moodboard, Metadata.

DESIGN DNA AND ITS RELATION TO STYLE

DNA is a long molecule that contains the genetic code, you can find the DNA in the cells of animals, plants and bacteria alike. DNA defines both the physiology and morphology of an organism [1]. Morphology refers to form, structure and configuration of an organism and physiology defines interactions within an object. Organisms in the same species are “similar looking but different”. Organisms that share a similar DNA, also “share similar morphology and physiology”.

Style on the other hand usually refers to the distinctive visual elements, techniques and methods that identify an individual artist’s work; they are the signs that make us assign works to an artist [2]. This is possible thanks to the shared aesthetic values, similarity of compositions and proprietary techniques used by the designer which in return results in “similar looking but different” designs. Works of experienced artists usually “share similar morphology and physiology”.

I especially repeated “similar looking but different”, and “share similar morphology and physiology”, and we will get back to it. Meanwhile, imagine a new design or art student. She is yet to develop her own techniques and personality and therefore lacks a well defined “Style”, her works do not “share similar feelings”; she does not have a style because there is not enough consistency among her works.

Consistency is possible by “repeating” the same behavior, similar techniques and other audio, visual and sensational information in your works. Experienced artists are usually consistent and therefore we say that they have styles, [3] but actually virtually no one sits on a table and says “I will develop a style”, because till today, style is not tangible; people have it, but usually do not know how they have it or how they have acquired it. Style is usually reflected in action rather read from a book. Style is something that we had to develop ourselves.

But it doesn’t have to be like that. Styles could actually be turned into tangible information when we clearly identify the different aspects of how we define the style [4]. For this reason I would like to introduce you the Design DNA concept. Design DNA (DDNA) is a formal inscription and formulization

of “Style”, the aim is to break the style into information pieces that could be accessible, so that it becomes tangible; when the style could be expressed formally, it is no longer just “reflected in action”, it becomes teachable and learnable from books and other audio visual or sensational sources.

So how can we break the style into pieces? Before that, we should understand metadata and metametadata. Metadata is information about other data; metadata is data about data it is information regarding other information; description about description. DDNA on the other hand consists of metametadata. Which is description about description about description; information about information about information, it is data about data about data.

An example: consider a painting; a painting is a type of visual information. The background color of this painting is also an information; when we describe the background information it is the metadata; an information about the other information [5]. So what is metametadata here? To continue our example, imagine a probability table of the background colors for the paintings of an artist; it is information, about information about information. It is “information in the form of probability table or moodboard” of “information of background colors” of the picture which is also information itself.

Like genes make up the DNA, the metametadata is the basic building block of DDNA and therefore the Style. To make it tangible, we need to formalize it, to do so we can express the metadata in for example; XML format. XML is extensible markup language which defines rules for the construction of a document or object depending on the context.

Consider SVG (Scalable Vector Graphics) files, these are images that are explained by an XML file; this file, in plain terms, states “Draw a rectangle here”, “use color x there”, “make a circle at location X,Y” etc. It gives readable information about a design, if you know the Cartesian coordinate system; you can even read and draw a picture from this particular source [6]. Likewise we could consider X3D files, which are also computer files that use a similar methodology to define an object, its material properties such as reflection, refraction, transparency index, and every each little detail and information expressed as a different chunk of information. Procedural images, graphics and objects can be created using the controlled variables of such files; most of the data is kept constant but something little changes; this result in a series of new “similar looking but different” designs or objects that “share similar morphology and physiology”. In a sense; there is a style.

We could use a similar way to define a painting; for this reason we need to make a fast study of paintings. Our first aim is to see the different available data; what are the different characteristics of a painting; when an expert looks to a painting what does he see? An expert might consider the physical properties and psychological context [7] ; what does the picture depicts (still life, portrait, historical context, animals etc), and how it depicts it (what is the mood; happy, sad, notr), which colors are used (vivid, dark, pastel), how is the brush strokes (thin, thick, smooth or curved). Material used (watercolor, acrylics, oils, pencil or chalk), the canvas size and dimension (millimeters or meters), the scale and proportion of objects (common scale, uncommon scale), perspective (isometric, perspective mistakes, illusions), texture on the surface; amount of ink or paint used, the year it was drawn, the angle of the brush, mediums used etc, but and there are various of other information that we can check for.

All these information that we list about the painting could be used to describe and communicate this particular painting; what we did was to underline the metadata about this painting. It is like the prescription or calories data on products, a summary of the design, data that we could use for benchmarking; design specifications. But these are only the metadata [8].

Our aim is to reach the metametadata; for this reason, our next step is that, for all the paintings of this artist (preferably in a given era, as artists could change styles in special occasions in their life), we need to repeat this identification and specification process for all the different paintings; we write down all the particular details of all the paintings; again for each of them for example we write down the colors, strokes etc. At the end of this process, which I call as extraction, you will see that experienced designers and artists have a lot of common elements shared among their paintings, these common elements (Nodes of the DDNA) could be expresses verbally such as; uses “most probably thick brush”, “mostly vivid colors”, “mostly curved lines”, or as tables and mathematically; %32 gray, all canvases > 20 cm, or they could also be expressed as sensationboards, statistical distributions [9] or moodboards; a chart of colors, a list of strokes, a collage of materials etc. No matter how we express them, as long as we express them we are indicating the “style”.

This method can be applied into all art & design fields, objects and cultures; we can find details on furniture design, graphic design, ceramics and sculpture making, glassworks, architecture and we can identify different cultures, different art movements etc by building our metametadata.

Even though the DDNA could be near perfectly written with tedious details, it is better to have a quick and easy method, so rather than making a list of all the details, we can actually focus on the major details, this helps us save time and make it easier to understand the style.

For furniture design I made a list that consists of 17 nodes; Scale Node, Price Node, Nature Friendliness Node, Production Technology Node, Material Node, Function Node, Soul Node (The Core Idea), Usability Node, Color Node, Texture Node, Historical Reference Node, Fabrication Quality Node, Graphic Element Node, Social Desirability Node, Conceptual Reference Node, The Message Node, The Form Node. For paintings it would be different (I did not make this list since I am not an expert on painting).

You might have realized that in my example, I considered natural, social, formal and applied sciences together because I wanted to reach to the widest information. When we approach to an object from different fields, we get the most widest information; material science, economics, psychology, history, color science, engineering, chemistry, topology, biology, anatomy, ecology, mathematics, logic, law, linguistics, politics, sociology, statistics and all other sciences should be considered [10] , when we are to talk about a “Style”. It is important to understand that a painters style cannot be explained by “drawing terms” only; thus the search for widest information. Wider information, that considers more scientific and social study fields is more user centric and results in a better understanding of style.

On the other hand, sometimes deeper information could be useful, to clarify further what the artists style is. Deeper information subdivides a particular information node into different niche information; for example consider the Form Node. We could express it and subdivide the Form Node further as Height Node, Depth Node, Width Node, Sharp/Soft Node, Style of Ends and Middles, Organic or Geometric, Amorphous, Asymmetric or Symmetric, According to Proportions, Liquid or Gel or Solid or Gas etc.

Sub dividable nodes can be better explained visually; through sampleboards and moodboards (of course video and sound could also be used). A moodboard consists of images, and a sampleboard consists of samples; for example Texture Node could be expressed by real objects; with material samples. When the node could not be made more detailed, we can express them as numbers, or as text. Probability graphs, charts and other graphic representation could also be useful, but if expressed everything interms of sampleboards and moodboards that is easier to digest and learn. The aim is to provide the most information with the least amount of effort.

So for example for paintings, rather than listing every possible information, we could just create sensation boards of brush strokes, moodboards of colors (or color charts), and write down historical or political context, and also list some other major details as the DDNA, and then when required, we could go on deeper and write-down more details.

DDNA EXTRACTION

Perhaps we should proceed with a working example to understand how it works; how could we create a new style with Design DNA, to construct a new style, first of all we can define or choose a domain. A domain is a source of information nodes.I have previously told that we can use the DDNA concept to analyze cultures, and cultures are actually very rich sources for information nodes.

Fig.1 Domain

Culture is a very rich source for information nodes and could be approached from many different field ranging from communication, sociology, social theory, politics, political economy, media and literary theory, video/film studies, philosophy, art history and many others [11]. Here we picked Japanese Culture as our domain, but we could have picked non-cultural domains as well; all sciences could be considered as domains; you can pick biology, and focus on bacteria and then focus on the shapes of bacteria which could actually be really nice.

I have chosen my domain as the Japanese Culture and I will focus more on this; however there are millions of building blocks of Japanese culture, and we have to make a decision on which particular area to focus on. We should first make a research of “status quo” what exists and what not.

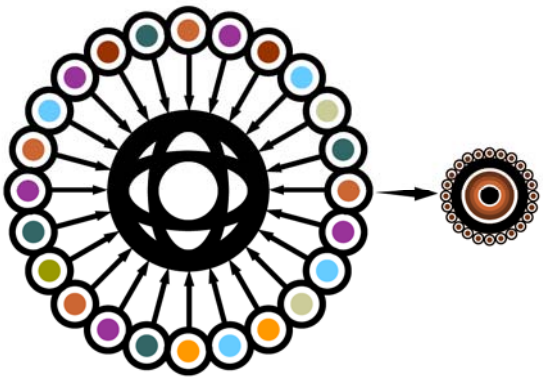

Fig.2 Focusing on a Sub-Domain Element

As we are going to make an example on arts and design, I start my research by making a large moodboard (collection of images) of Japanese culture; dresses, language, imaginary, architecture, people, arts etc, This general moodboard is weak; because the information contained is too wide, but it is helpful to let us see what the e the “opportunities” are. After I made such a moodboard, to make it stronger, I have decided to focus more on the visual elements in Japanese culture; therefore my focus is now on the graphics and paintings.

Fig.3 A Sub-Domain Element

However, sub-domain (sub-cultural) elements could also be rich, I underline different visual elements in architecture, kimonos, paintings, sword tilts, pottery, anime, street art, family crests, kites, origami papers, stamps etc. plus I consider the silhouettes of Japanese objects, the writing systems Hiragana and Katakana.

TIP: An easy way to make this research is by an internet search query of all the different graphical domains; search for “Japanese Stamps”, “Japanese Pottery” etc and collect graphics. . What I have in my hand at final is thousands of images. But we need to focus further. Our focus will continue till we have many “different but similar looking” images.

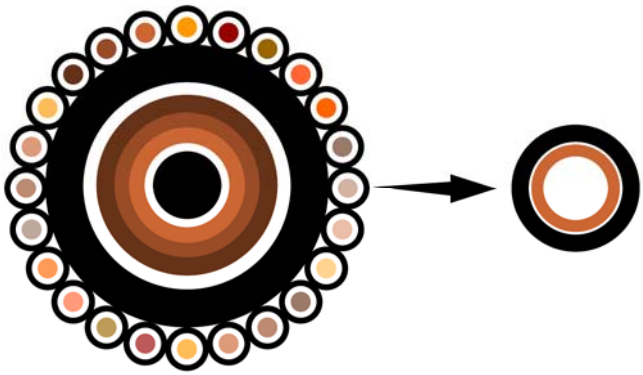

Fig.4 Focusing on a Cluster (Micro Domain)

Finally, we reach clusters (micro domains) in the selected domain / culture; we could also think them as “point of inspirations”, in most cases, we can communicate these with the help of visual/mood boards, however even the micro domains contain a lot of information, before we make a choice of what to take from this cluster, we can express this particular micro-domain with the help of sampleboards and moodboards.

While sample-boards make use of “real samples” to express information; (such as material samples for a material library), moodboards uses images, moodboards are in essence are also info-graphics [12].

Fig.5 A Cluster

A cluster is a point where we can get inspiration and extract the nodes, it contains “similar looking but different” images, “similar shaped but different” forms, “similar sounding but different” noises; “similar but different” so that there are shared and common information within the members of a node.

Fig.6. A Moodboard of Images.

A cluster can be expressed as a collection of images; moodboards. When we have a moodboard at hand, the important thing is that a strong moodboard for our purpose should have many “similar looking but different” images (which proves that we have focused deep enough to reach a cluster), so that we could underline these similarities, when we underline the shared elements and similarities, we are indeed extracting nodes from a micro-domain.

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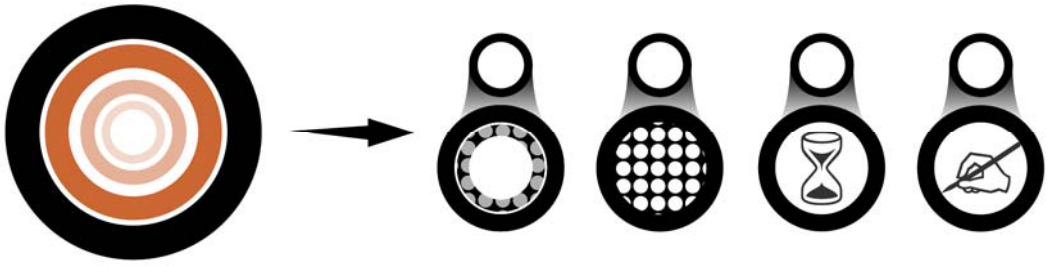


Fig.7 Nodes in a Cluster

Not all nodes could be available in a given cluster, sure we can extract millions of details from any moodboard (of a micro-domain, of a cluster), but the most important ones are the most visible / highlighted elements, these highlighted elements are the nodes and we are especially searching for nodes that contain repeating or common elements.

Going back to our Japanese Paintings moodboard (Fig.6) we can see that mostly the following are dominant details: Colors: “Similar Colors”, Backgrounds: “Solid Backgrounds” (Backgrounds have a fixed color or with very little texture). Tones: “Gradient Monochromatic Images” (Drawings in the front have less color variety but have a lot of tones), Strokes: “Usage of calligraphy style drawings with smooth lines”. Technique: “Waterpainting”.

Fig.8 Extracted Color Nodes

Why Fig.8 is not so good? The colors from the Fig.6 were exported, but we have lost a lot of information; when defining styles, in addition to what is inside, we need to write down “how much” is inside; compare it to a recipe, if you just list the ingredients it doesn’t work.

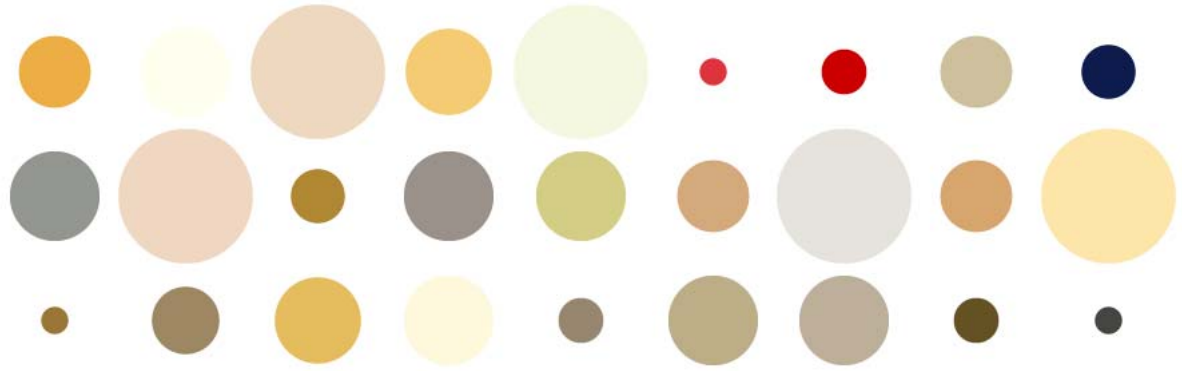


Fig.9 Extracted Color Nodes with Statistical Probability

This is a better moodboard, it is not just a list of colors, it is also an infographic; it tells us the average weight of colors as it shows the statistical distribution of colors in the traditional Japanese drawings.

We could develop this moodboard further by making two of them; one for the backgrounds and one for the front images. It is amazing that we can learn so much once we focus enough.

2D Painting is relatively simple (no 3D; no texture, no form etc) than objects, 3d artwork such as ceramics and sculptures, and that is why I have been following such an example, but still we need more than one node to make a style. I am going to choose the some nodes in addition to the “color” nodes that I have extracted from the Traditional Japanese Paintings.

A Sample DDNA (Formalized Style)

This is a very simple style that I am making up for demonstrative purposes; imagine a Neo-Traditional Japanese Painter (perhaps effected with Dadaist and Pop-Art movements) makes drawings such that all of his drawings share the following aspects:

> Shape Node: “Rectangle 3:1 Canvas with Circles as Images” : The canvas, this designer picks will always be rectangle with 3 to 1 proportions, horizontal, obsessed with 3 and 9 and symmetry, this particular artist draws 27 circles (9 in a row and 3 rows) with uniform distribution.

Color Node: “Traditional Japanese Painting Colors” : As a lover of Traditional Japanese Paintings, the artists refers to the Moodboard in Fig.9 for choosing colors, she fills the circles and the background with these colors, to remind you, in Figure 9, we had found out that there are different background colors, contrast colors and standard fill colors in Traditional Japanese Paintings.

Social Node: “Signature” : The artist draws a signature on each of her drawings to create a social link between the artwork and the artist.

I had chosen this sample example so that I could continue with writing a program that actually could generative artwork by using the given guidelines, even with so little variables we can have millions of different artworks.

I had chosen to express the sample DDNA with text, but we could have expressed it as sampleboards; moodboards of colors, the image of the signature, and the moodboard or sample for the canvas.

It is for sure more that complicated styles could be expressed easier with visual presentation techniques, however, if we want to formalize a style, we can make a bit more work and express a style in “natural language”.

A SAMPLE GENERATIVE DESIGN DNA

When we introduce some randomness to our DDNA, we can have the Generative Design DNA (GDDNA), here for our example, the dimensions of the circles and the color variations are based on text inputs, which are translated into random but consistent numbers.

GENERATIVE DESIGN USING DESIGN DNA

The following are some sample drawings that were generated by the Avatar Bes (the program I wrote for this paper); an avatar is a piece of software that emulates the Design DNA. My concept was based on creating something like Fig.9 without doing any actual drawing myself.

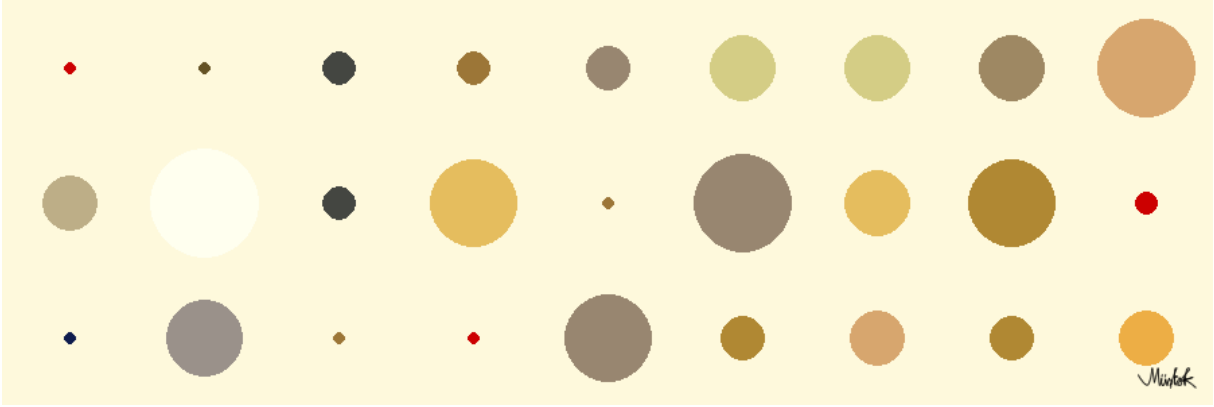
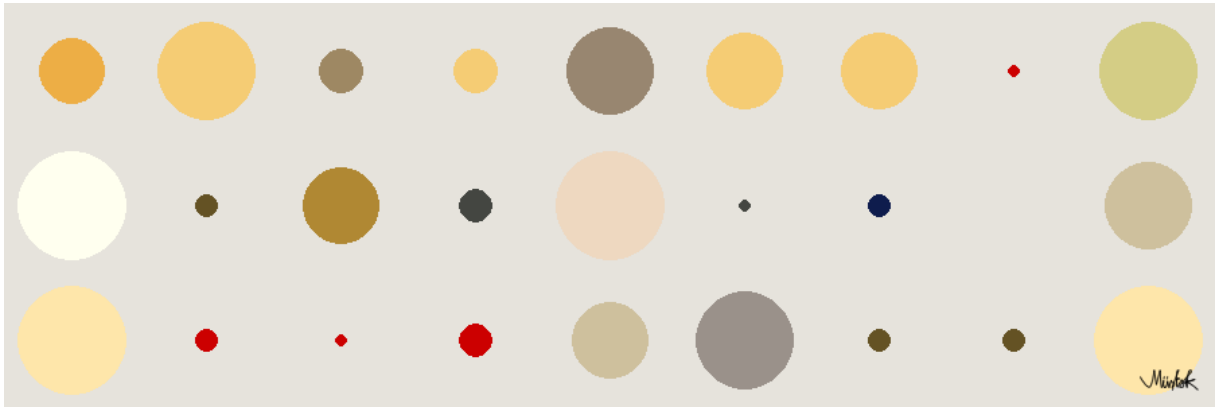
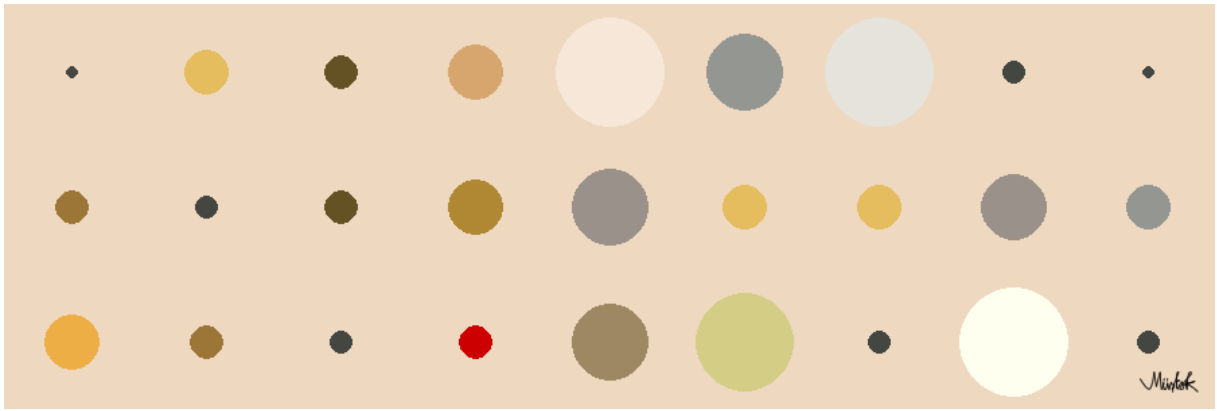


Fig. 10 A Generated Image (from inputs: PAINTING + DYNAMIC)





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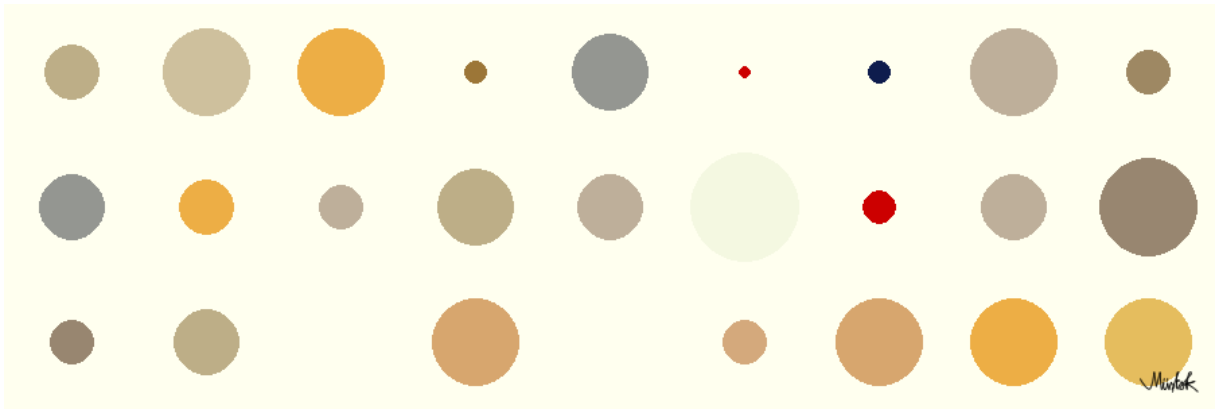

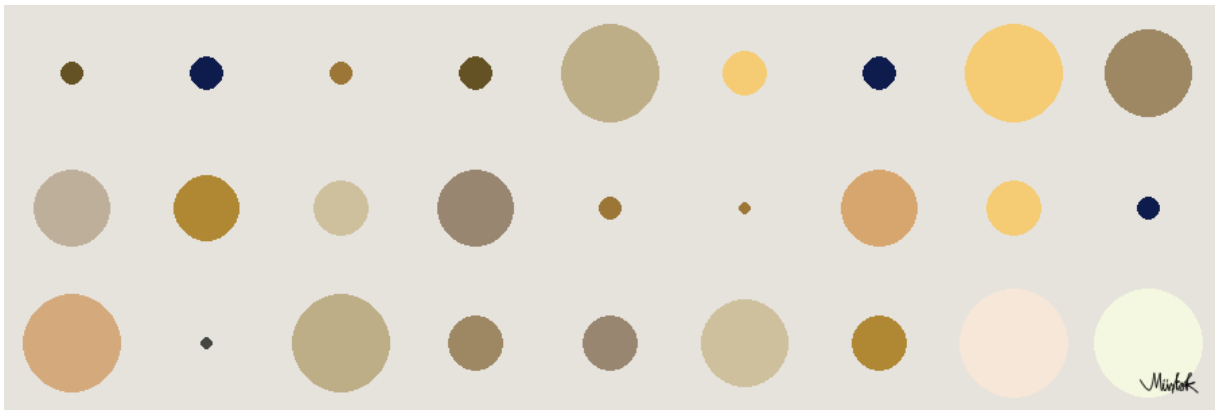

Fig. 11-14 Other Generated Designs

I especially spent quite a time to write a unique program for this paper, but please note that I am not a programmer, my purpose for writing the program was to prove / test the fact that we can create / generate a series of “similar looking but different” paintings based on a design DNA, strongly tied to a cultural domain with also random elements to provide additional domain. I believe that we are successful in our test and therefore at this point, you will probably agree that the Design DNA is a formalized expression of “Style”.

For each such program, or design process, we need to write down or imagine the process flow. Here is my algorithm for Avatar 5:

> Step 1: Create an empty canvas with the dimensions: Width 3X and Height = X because we wanted to have 2 to 1 proportions. Fill the empty canvas with one of the background colors we found in Fig. 9.
>
> Step 2: Draw 3 rows, and each row draw 9 circles.
>
> Step 3: For each circle from 1 to 10, make a random number Q, and use this number to scale the circle. If the scale (Q) is small, use the dark/contrast colors from Fig.9, if the scale (Q) is big, use background/light colors from Fig.9, for other Q use the common colors of Fig. 9
>
> Step 4: Stick the artist’s signature to the generated image to impose a feeling of brand identity; a designer’s mark or uniqueness, to form a social link.

Conclusion

We have discussed what the Design DNA is and how we could use it to define the “Style” in a tangible, formalized way, further more we have shown an example how how to derive and extract “Style Nodes / DDNA Genes” from cultures, for that we started with Japanese Culture and made our demonstration on Traditional Japanese Paintings. In the same domain, we also had demonstrated a working example of using Design DNA in a Generative or Simulative way to come up with new designs and artworks that are based on a particular style (DDNA); we created generative artworks for our imaginary artist.

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Genetic approaches, which rely on sequence alterations to establish the biological relevance of a DNA segment, are often considered a gold standard for defining function. Mutations can be naturally occurring and identified by screening for phenotypes generated by sequence variants (13, 32) or produced experimentally by targeted genetic methods (33) or nongenetic interference (34). Transfection studies that use reporter assays in cell lines (35, 36) or embryos (37) can also be used to identify regulatory elements and measure their activities. Genetic approaches tend to be limited by modest thro STYLE-BRANDING, AESTHETIC DESIGN DNA Bob EVES1 and Jon HEWITT2 1 Bournemouth University 2 Motorola Limited ABSTRACT. This paper is a continuation from papers presented at previous PDE, EPDE and SEED conferences.Â When defining a language as one might expect, design principles are discussed and agreed way before the physical form is developed. Areas that need to be considered depend on the project and the product. Generally design principles and language are already defined when it comes to a raw project.Â Discussion takes place as to whether a fresh approach i.e. a different language could be applicable. As discussed, the DNA goes way beyond the physical.