BWAIN: An Artistic Web Interpretation

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Abstract. BWAIN is a creative web browser which uniquely combines graphics and sound using the HTML structure of any selected web page. The structure behind the web page which normally remains unseen, is revealed in a process of visualization. The HTML Code acts as a genome for building an image which looks and sounds quite distinct. Several web pages may be linked with each other and thus reflects the character of the web. The user may achieve a wide range of styles in the visualization and actively navigate through the scene by scaling and translating the image. The opportunity to scale and transform the image becomes a creative process resulting in varied compositions.

Keywords: Browser, Generative Art, Sound, Interactive Media.

1 Introduction

As both artists and computer scientists, we determined to conceive of a project which bridged both art and technology. How could we unite our visual abilities with our technical experiences in a unique work? Brainstorming began and we looked at significant projects, both local and international, so as to assemble inspirations which we could build upon. Computing, aesthetics and sound fascinated us and we pursued some ideas. We decided to build a program based on accidental occurrences. Other standardized graphic programs are limited in design quality, so that became yet another goal. Digital techniques are often only imitating real things rather than developing new approaches. This thought led us to contemplate and experiment.

The basic thinking behind this project had to do with the connections and parallels in pictures and sound. Both areas hold common ground: colour space, harmonies, contrasts and spatial compositions exist in art as well as music. Could a visual piece be woven together with a musical piece? What would happen if visual principles were applied to musical concepts? Is it possible to represent mathematical or physical models acoustically? Could one apply sound to a spatial representation which is two-dimensional or three-dimensional? And could one possibly navigate through this space?

Analysis of the paintings by the American artists, Elizabeth Murray and Al Held provided us with ideas about colour and shape assemblage. Lauri Groehn [4]

of Finland found a means to digitally translate paintings into sound. An earlier software program called, Create and Learn [1] was developed to work artistically in a digital manner. Here the user may learn basic principles in colour and design and be able to create multiple works which may be saved.

Several discussions about music led us to question digital music. We found two sources to enhance our idea search. One was the work of a group of computer science students [5] led by Claudio Midolo, who designed a musical instrument which combined graphic drawing with sounds and melodies. When a person holds this instrument, moves it and makes gestures, the result is a graphical translation of these movements on a digital screen. Here drawings in line, shape and colour can be realized and questioned. The second influence was the work of Yu Nishibori [6] who developed an electronic instrument with a graphic panel for controlling the sound. Still another project by Marcel Salathé [7] influenced our work in the use of the HTML structure to produce an image. The result was simplified geometrical configurations in colour. Our interest was to build upon this in creating more complex imagery.

The concept behind BWAIN was that one could access the endless source of structured data from the World Wide Web and use it as a basis for an acoustic and visual representation (Fig. 1). The result is an alternative browser which over the Internet, uses structure and layout information provided by the HTML and CSS files. This allows a process of representation which grows and develops. Through HTML links, there are navigation possibilities between the web pages. This gives the user the chance to work in an artistic manner, in an abstract search through the World Wide Web.
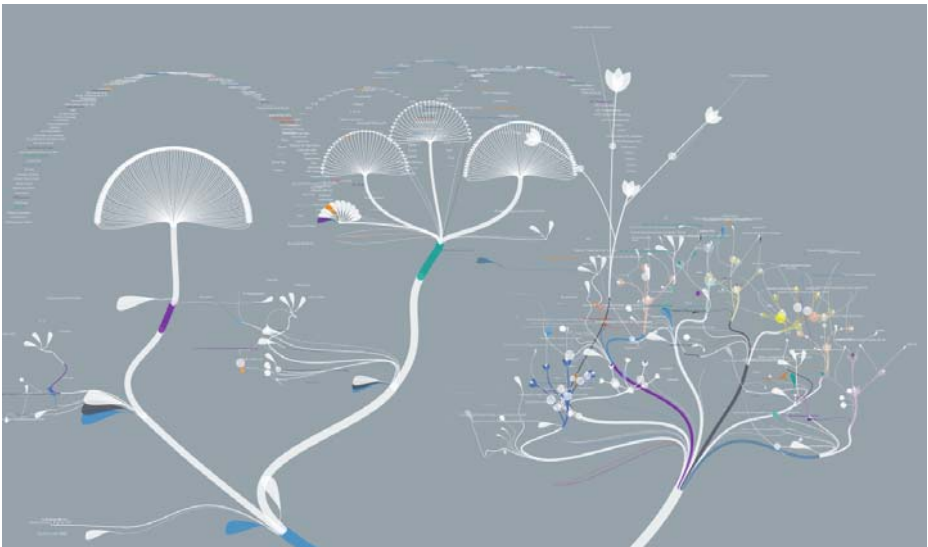
Fig. 1. The hidden structure of the web page `www.ard.de` is revealed in this artistic realization in the program BWAIN

2   Program Development

A previous project called Cellarium [2], served as a basis for discussion. Cellarium is a microbic simulation using mathematics and biology in a visual orientation. Microbes and their paths, represented through various functions in a colour composition use generated rules to create ever-changing results. The interaction between microbes in eating, pairing and hunting were used in conjunction with melodies, chords and harmonies which resulted in abstract compositions of a particular character. This idea led us to consider how we might build dynamic structures which were visual and acoustic in nature. Using static information masses to represent and influence them, we struck upon the notion of *creative browsing*. We began by reading a web page and analyzing its structure in terms of basic elements. The original structure of the web page would remain unchanged, however tags and attributes were used to define visual and acoustic elements, resulting in a completely new representation. The user sees an abstract structure growing and simultaneously, hears an acoustic composition. Through the selection of links, the structure may divide further and develop.

The results produced by BWAIN in terms of growth and aesthetics, is similar to the idea behind generative art. Professor of Art at New York University, Philip Galanter [3] defined this as practice by which an artist uses a system, and sets it in motion so that a relevant creation may evolve. Presently, there is a variety of generative art programs which may be built and navigated using computer programs. From random colour shapes to complex simulations, observers may react and view this as art. Two artists, Marius Watz [8] and Martin Wattenberg [9] take music, analyze it and generate a graphical output.

This project BWAIN is connected as well to generative art, while the results allow the viewer to enjoy basic formal principles, as one would when looking at an artwork. The fact that the visualization is derived from the Internet, promotes the idea that a system was used to develop the program. Every web page has in its basic HTML text, a tree with specific features, individual functions and changing complexities. This information is applied from web pages and then transformed, structured and represented using the web browser. In daily life and use, the content of a web page is important, but most users do not realize what lies behind the scenes. Its background structure is the supporting frame for all textual and graphical components, making the facade readable and comprehensible. BWAIN interprets this structure and substantiates the invisible nodes of a web page, making this a visual reality. If one departs from this expected and ordinary perception, the structure of a web page runs parallel to the interpretation of a musical piece in which rhythm and melody develop. Simultaneously, visual and acoustic elements swing together in cadence. After selecting a favorite web page, a creative process unfolds: a structure develops, grows and produces results. This process may be intuitively manipulated and directed by the user, whereby influences from the page and user choice may cause homogeneous results in both picture and melody.

After creative browsing was conceived, we sought to develop a strategy. The concept of *Director* was designated as the center point of our project. The

responsibility of the Director was to control the visual and acoustic results through time limitations in repeated rhythms. Next, a data structure was necessary so that the web page could be transformed.

3   Sound

Along with visualization, sound plays an important part in the presentation of the web page. The visual construction is dependent upon the speed of the music and provides orientation in terms of tact. Each web page possesses an individual flow in melody line with a particular length which is repeated endlessly, but with subtle variations. The various HTML nodes summoned from the particular web pages are given an additional tone which during the interaction of the Program, can be integrated in the existing melody line. The *Sound-View* consists of various components with different functions for the acoustic realization.

The *Metronome* provides the tact for the music as the visualization process builds. It is given a speed in terms of beats per minute (BPM) which determines the periodical intervals in which it triggers actions for the visualization. The *Metronome* is instrumental in defining the *SoundView*. It generates a melody track which is sent to the synthesizer and may be played as a loop. Composed of a soundbank, the synthesizer is the actual producer of sound. All information about the music is transmitted by the synthesizer in the form of MIDI (Musical Instrument Digital Interface) data which are transformed into acoustically perceptible signals. At the moment, the synthesizer is realized by a standard Java soundbank, which uses audio samples. The soundbank may be replaced at any time by another type of sound production. At present, the generated melodies only depend on the form of MIDI data and therefore, may be linked to any desired synthesizer. The *Composer* is responsible for the generation of the actual music. It contains algorithms which generate melodies for various instrumental elements (bass, chords, rhythm). Every web page has a pattern of melody which consists of many tracks, in which various levels of instruments are represented. The various tracks are generated with different algorithms and then brought together in a MIDI sequence. This generated sequence is in turn submitted to the *Metronome* which plays them back. The *WebMusic* component is the connecting link between the HTML code of a particular web page and the generated music. In this part, the web page is parsed for meaningful input values, suitable for the algorithms of the *Composer* element. Here musical values, such as key, length of the melody and number of tracks, etc. are determined for an individual acoustical performance. Thereby, attributes such as the length of the URL, the number and the existence of particular tag types, etc, are taken into consideration. It should be mentioned that the *WebMusic* component does not generate the music completely out of the HTML code. One would need too many parsed values for each web page to sound identical and therefore, the melodic patterns are varied at random, but maintain the same character in tempo and key.

4   Visualization

If one should analyze BWAIN from its functional side, it is a web browser. This means that documents in the HTML format are parsed, read, analyzed and the components separated. These basic elements or tags are instantiated as objects and sequenced according to importance. Every object is represented by a tag on the HTML page. Each object possesses an attribute which is defined by the tags. Attributes possess characteristics such as colour, typeface, height and width, etc. How may we transmit the abstract information to the user? For one, the acoustic signals which are generated from the *SoundView* and two, in the form of visual clues provided by the *VisualViews*. In order to achieve synchronicity between the visual and audio components, a beat was introduced. Through a metronome this beat functions as the initiator for the growth process.

VisualViews are the visual representation of a corresponding HTML tag. Attributes from the HTML tag define the size and colour of the views. Different tag types result in variations of *VisualViews*. For example, the view of a body-tag looks different from the view of an image-tag. An important constructive element of those *VisualViews* is the Bézier curve. The thickness of a curve depends on the quantity of the load it must carry. One may compare this to a tree branch which must support the weight of its descending parts. Generally, one can distinguish between three groups of *VisualViews*: the organic, the geometric and the typographic. Organic views have a plant-like appearance (Fig. 2). The Bézier curve serves as a stem with leaves, fruits or blossoms emanating. Geometric views consist of basic forms such as circles, rectangles and lines. The typographic view is applied to text nodes in the HTML tree. It simply
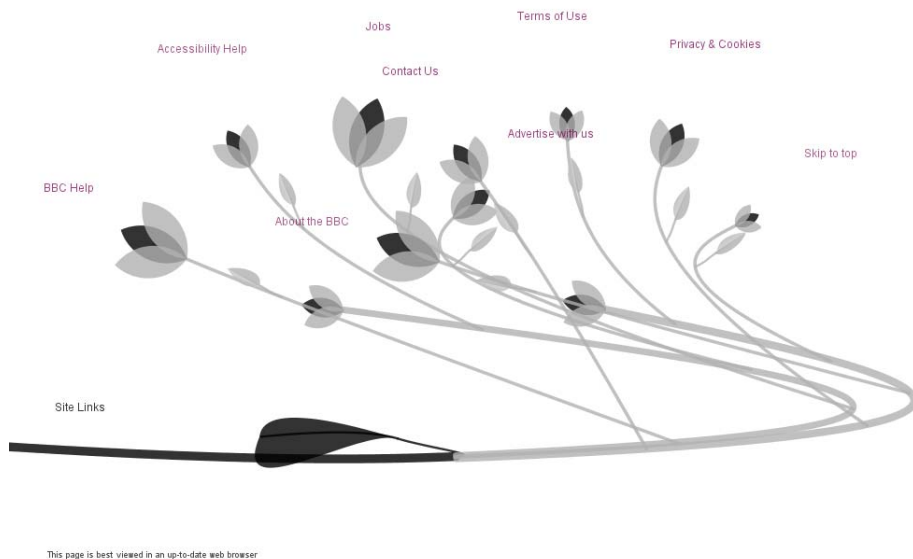
Fig. 2. Detail of the visualization of `www.bbc.co.uk` showing organic forms and text

shows the text of the web page. The way these views are mapped to the HTML tags is partially pre-defined in the program, in part due to the choice by the user. Using a slider bar in the *Control Panel* one may select an organic or geometric appearance with all possible variations between them.

5   User Interface

From the beginning, it was clear that we did not want a standard desktop application, but rather, one with aesthetical demands with an unconventional user interface. In addition, we had no interest in competing with functional applications. Standard *GUI* elements and the *Menu* were reduced for the sake of simplicity. Please refer to figure 3. The user has a *Control Panel* from which to begin, but then has access to a *Debug Panel* for further possibilities.

Fig. 3. Main Window with the Control Panel at the top and Debug Panel at the right

The user has two options to navigate through the scene. By dragging the mouse, you may *move* the field of vision. A *zoom* feature is possible by rolling the wheel of the mouse. The position of the mouse cursor may center on an object and zoom in and out, depending upon the desired movement. Yet another possibility occurs through *picking*, or selecting a particular node from which a sound emanates. *Rolling over* an object with the cursor causes a change to occur. For example, when the cursor moves across a word, rollover produces an unfolding of the full text. Other functions were programmed into BWAIN: *screenshot* and *soundshot* offer one the chance to save the visual and acoustic results. Both the *Debug Panel* and the *Control Panel* may be blended out, so that one may view a design in its entirety. The *Debug Panel* offers an array of other possibilities for the user to experiment. Here one has the opportunity to change the look of the image through

selection of programmed *Views* (*visibility*) which generate different reflections of a website. One may alter the grouping or direction of the image through its tree construction, or *branching mode.* These adjustments affect the way the elements are composed on the surface. Apart from the default tree setting, there is a random mode, which creates a very abstract look. When the river mode is chosen, the elements align themselves in a global direction, much like the flow of water. The orthogonal mode aligns all elements in horizontal and vertical directions. This may result in a composition that resembles technical imagery such as roadmaps or circuitry. The node type mode assigns individual branching modes depending upon the type of element used.

6 Conclusion

BWAIN, in its current form is transformable, and has the potential to expand in several directions. For example, one could show the entire free navigational three-dimensional environment. This form of representation would further develop the tree-like character of the web page. It would also be conceivable that in combination with quicker drawing components, continual animation could be implemented such as a perpetual wind or simple movements represented through shifting and turning. BWAIN serves to creatively inspire. A local artist reflected on the work by saying, that the typically unseen structure of the web page becomes the focus and therefore, the information content is unimportant. The function of the web page has changed and thus, becomes a work of art.

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