Web-based Form as Expression of Networked Sociality in the Community-based Piano Piece *Wiki-Piano.Net*

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Digital and virtual dimensions play an essential role throughout Alexander Schubert's work, among audiovisual media, mechanisation of performative gestures, stage setting and computer tools for composing. *Wiki-Piano.Net*, based on the 'wiki' peer-production principle applied to the artistic field, is one of his first experiments with online communities' interactivity. This article investigates the relationships between author, users and performer through the editable website. The intermedia approach extends and reflects human beings' compositive and performative possibilities. Indeed, a wide range of internet sources communicate with the historical reference of the piano repertoire while also reflecting recent online habits. Nevertheless, the preset form anchors its expressivity to a specific communication, referring to the author's informatics-digital attitude and a further staged representation. The man–machine dialectics is consequently expressed on different levels, also entailing acoustic-gestural and audiovisual contents. Questioning the authorship principle and generating a non-hierarchical network, *Wiki-Piano.Net* reflects Schubert's aim to create a collaborative work towards which he has no control. However, the virtual environment results are strongly influenced by his settings and artistic attitude. The interaction, hence, derives not only from online users but also from the creator and performer through fundamental website mediation.

1. INTRODUCTION

Composition through networked systems is a salient factor in the Alexander Schubert's latest production. This approach derives from the recurrent use of various analogue media – such as sensors, lights and visuals – and digital means – including software and programming languages such as Max/MSP and JavaScript (Schubert 2017, 2019a). However, the performative dimension linked to the musical factor remains central to most of his works. Giacomo Albert defines this trend as 'post-music', which 'does not indicate a specific form but an extension of the concept of music encoded by tradition, taking place through audiovisual forms in a broader sense' (Albert 2019: 87). Even if coming from a 'sound-based music' tradition, where 'collaborative works or works by intermedia artists often create situations whereby

the sound "lifts" the image or vice versa' (Landy 2007: 159), the author moves further. Indeed, he refers to a post-digital perspective, where digital devices are not novelty elements but a 'sweeping yet invisible part of our everyday lives' (Negroponte 1998). The compositive and onstage approaches remain linked to past references, even though transferred to a more comprehensive perspective regarding the digital apparatus (Ciciliani 2016). Consequently, Schubert merges various media as expression and synthesis of more abstract environments. Friction and interconnection between physical and digital or human and machine persist as crucial factors (Parker-Starbuck 2011; Drees 2014; 2018; Hurt 2015; Kanga and Schubert 2016), also referring to the theatrical and bodily dimensions related to the 'New Discipline' theorised by Jennifer Walshe (2016). Especially in recent years, this dichotomy is also inherent in 'real' and 'virtual' dimensions and oriented towards the recovery of a renewed social context (Schubert 2018a, 2021b). This trend is part of the most recent networked and immersive pieces – such as the participative installation *Control* (2018), the interactive virtual performative installation *Unity Switch* (2019), the online computer game *Genesis* (2020) and the parallel social network created by the autonomous AI-bot collective *Crawlers* (2021).

Wiki-Piano.Net (2018) for piano, internet and video reflects these perspectives, also including a classical ensemble extended by digital devices – as in *Weapon of Choice* (2009) for violin, sensor, live-electronics and live-video, *Point Ones* (2012) for augmented conductor and small ensemble, *Scanners* (2013) for string quintet, choreography and electronics, and *Convergence* (2021) for string ensemble and AI system.[1] To this extent, the piece moves towards the most recent approach mentioned previously, referring to a classical onstage representation but also involving a virtual and networked environment. It is

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[1] The recent performance at Trossingen, providing a broader ensemble, implies that even the piano and the pianist are relative features. However, it does not question this principle (Schubert 2021c).

the most performed in the *Community Pieces* collection, focused on multiple authorship and the users' editing of online material as well (Schubert 2021a). The inclusion of many references – not only regarding the piano – within the same platform relates to a hybridisation process as 'reuse and recontextualisation: about taking something associated with one genre, one historical time-frame, one culture and putting it in another' (Waters 2000: 57). Interconnections between heterogeneous material occur first on the website, where users manifest their personal attitudes by modifying preset modules. Moreover, the available contents reflect the author's setting, which recalls the many references further analysed. The website establishes a communication taking place on separated stages and from different perspectives that progressively define its facets.

1.1. References

The only scientific contributions about the piece are two articles written by the pianist Zubin Kanga, who also commissioned it. In addition to the one regarding interpretation strategies (Kanga 2021), the other explores some of the contents typologies and contemporary intermedia trends (Kanga 2020). Even if providing a broad insight, the scholar does not analyse internal processes implied in its various stages, reflecting descriptive observations oriented by his performer's role. Thus, the present survey has been structured around the previously mentioned website's functions and their implications, as occurring through the different subjects' mediation. First, the relationship with neural networks is discussed (Zhang and Gupta 2000; Hu and Hwang 2002), addressed as a metaphor to opportunely frame the concept. This theoretical tool refers to the overall system, composed of interconnected modules and human–informatics components. Other works done explicitly focus this web-mediated process towards a further staged representation. For example, *Cathedral* (1997) by William Duckworth allows listeners to provide sound samples through the PitchWeb application, and *Brain Opera* (1996) by Tod Machover enables users to manipulate the performance and upload music, sounds and images (Wüst and Jordà 2001; Duckworth 2005).

It might be said that the piece's focus is on the process rather than authorship and uniqueness attribution, as in Fluxus works. The relationship seems evident in the open-form usage, allowing the control of fragments' sequences and juxtaposition in a completely different way each time (Nyman 1999; Gresser 2007). In most recent works involving the internet, the concept remains quite similar even though establishing 'a collective sharing, seeking networked responses of participants. Those kinds of

digital music environments tend to move the user from a bodily passive mode towards a more embodied and active mode' (Schroeder 2012: 37).[2] As a constantly evolving timeline, *Wiki-Piano.Net* also recalls the attempts made by SpecLab and Applied Research in Patacriticism (ARP). In projects such as Temporal Modeling, 'subjective activity can be formalized concurrent with its production … by creating a constrained visual interface' (Drucker and Nowviskie 2004: 433). For example, the 'nowslide' tool set 'allows a graphic literalization of … subjective positioning and temporal imagining' through a sliding icon, representing the subjective viewpoint, dynamically evolving due to the present state (Nowviskie 2004: 127). On the other hand, the piece does not provide immediate feedback of the editing but a delayed manifestation of networked interaction through the performance. Thus, it differs from works such as *Open Symphony* (2016), where the audience generates a score in real-time (Wu, Zhang, Bryan-Kinns and Barthet 2017). It rather recalls the primary reference stated by Schubert (2021b: 147), which regards exclusively graphical editing: *r/place* (2017), a three-day experiment on Reddit, in which each user changes the colour of $1000 \cdot 1000$ pixels canvas every 5–20 minutes (Armstrong 2018; Rappaz, Catasta, West and Aberer 2018).

The community interaction on the web score, acknowledged by the author as the central aspect of the piece, evolves within an online environment that recalls virtual realities, albeit without a computer-graphic representation (Bartle 2003; Burdea and Coiffet 2003; Castronova 2005; Bell 2008). However, the piece might or might not generate an implied communication, depending on shared references within modules. To this extent, it implies both the 'server' and the 'sharper' approaches defined by Gil Weinberg, respectively, considering the network for sending musical data to disconnected participants or allowing users to communicate by generating, modifying and shaping material (Weinberg 2005: 26–7). The social environment defined over collaborative editing has been studied through contributions on online communities (Hine 2000; Preece 2000; Taylor 2002; Kozinets 2010; Bainbridge 2020) and groupware (Preece, Nonnecke and Andrews 2004; Ebner and Holzinger 2005; Panciera, Halfaker and Terveen 2009). Moreover, community-based peer production has been attributed to collective interaction

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[2]For example, see works by Jason Freeman and Pedro Rebelo as *Graph Theory* (2006) for solo violin and web, and *Piano Etudes* (2009) for solo piano and web by the former – a collection of short musical fragments uploaded and linked by users and further interpreted by the players (Freeman 2010) – and the multisite network performance *Netrooms: The Long Feedback* (2009) by the latter – consisting of a live mixing of a feedback loop with the signals from multiple real-time streams from different locations (Rebelo 2011).

(Benkler 2002, 2006) concerning the 'wiki' software (Jemielniak 2014; Foote, Gergle and Shaw 2017), with a significant implication of the 'meme' principle (Shifman 2014; Milner 2016). In 2008, Andrew Hugill commented on widespread music-making in virtual worlds:

> The virtual worlds themselves are essentially object-oriented programming environments enriched with multimedia capability. These allow the users to build their own environment, to interact with other users, to create objects and so on. A virtual world is, therefore, made by its inhabitants according to their own imaginations, and in several such worlds musical communities are developing formed entirely of virtual musicians. They build virtual instruments, which they sell or barter, and they perform virtual concerts or have virtual jam sessions. (Hugill 2008: 118)

The *JSyn4* and *Jade* software mentioned previously, allowed users to develop interactive applications such as synthesisers, audio playback routines and effects-processing algorithms and to analyse, generate and process audio and video. Recently, several online platforms for sharing and editing material such as *NoteFlight* and *JamGlue* have emerged, respectively, consisting of a web-based music notation editor and an editing environment for multitrack audio mixing (Freeman 2010).

Wiki-Piano.Net is located in the tangle of these perspectives, allowing the free editing of some components through the Web, but with narrow creative margins that limit users in favour of the author's imprinting. Its aim is explicitly to depict the internet and observe the online community's behaviour with an empirical attitude. Interaction modalities strictly relate to the concept's evolution, highlighting an internal development previously defined by the author. Therefore, the prescriptive compositional intent has been studied in relation to the digital and intermedia basis of the piece (Di Scipio 2000, 2014; Manovich 2002), referring to the influence of the metadata principle (Buckland 2017) and hypermedia (Bolter and Grusin 2000). Finally, the piece does not regard entirely 'net.art' nor 'net art', where the dot between net and art 'allows us to distinguish between a net-native art that is also an art of networking (net.art) and an art that inhabits the internet without becoming a common language and project' (Deseriis and Marano 2008: 6). Even though exploiting the internet medium on a networked platform, it is not precisely 'net-native art', as it first belongs to the intermedia tradition. Insofar as the piece roots the collected material on precise performative dialectics, it remains a staged piece using heterogeneous contents and manifesting a split perception of the uploaded, observed and performed contents. The performance synthesis of the mentioned instances displays a classic setting,

regarding the piano references and the audiovisual reproduction: it results in a mixed music performance, which equally refers to the website as a score and a digital instrument (Jordà 2004; Arfib, Couturier and Kessous 2005; Emmerson 2009; Paine 2009). Indeed, the classic performative process also regards rehearsal and enactment. These dynamics establish a clear link with the past, implicitly re-codifying references in a variable digital structure (Albert 2019).

1.2. Main features

Wiki-Piano.Net was composed within the fellowship program #bebeethoven by the Podium Festival in Esslingen for the anniversary of Beethoven's birth in 2020. The first online publication dates back to 5April 2018, and the first performance was on 26 April 2018 at the Podium (Schubert 2020).[3] The inclusion in a project dedicated to Beethoven justifies conceiving a piano piece, taken as a reference to generate a more articulated community process. The composer explicitly expresses this intention in the introductory text, recited by the pianist on stage:

> 'Wiki-Piano.Net' is an interactive community-based piano piece developed by Alexander Schubert. The complete webpage of wiki-piano.net is the score to the piece. It consists of several sections. Some elements are fixed, like for example this introductory text. Some other elements are editable like for example the next sentence:
>
> . . .[4]
>
> The pianist performing this piece reads and plays everything that can be found on the internet page, from top to bottom. All elements are either to be spoken or to be performed by the player. The only exceptions are small comments explaining some editing choices in detail (displayed in orange).
>
> The visitor of the internet page is able to influence and change the score of the piece – continuously. This can happen at all times. When the pianist schedules a performance, she/he will open this website and perform the piece according to the content at that given moment. Hence, each performance of the piece will reflect the current state of the piece. (Schubert 2020)

The performance goal related to the piano reference is re-interpreted and extended towards a dialectical relationship between intermedia representation and multiple authorship. Indeed, it is possible to edit a two-staves system by inserting musical notes and their

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[3]In addition to the composer, creator of the concept and formal organisation of the piece, also involved are Christoph Lohse and the Büro für Exakte Ästhetik for the graphic realisation through Indesign and the analysis of users' participation (UI + UX) and Dominic Osterried for the development of the site using HTML.

[4]Users can fill in this space by inserting a sentence, which has not been included in this quote as it changes depending on edits and is not related to the presentation of the piece written by the author.
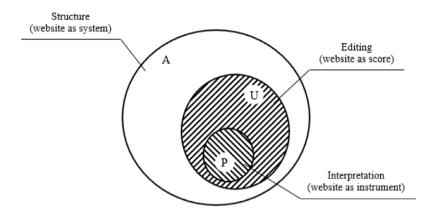
Figure 1. Main website's functions associated with the three subjects involved in the piece's definition.

dynamics as well as texts (including titles of subsequent sections or freely modifiable writings); actions to be performed, defined by users along with their duration; audio tracks forwarded from freesound.org; images selected from the internet and reported via URL; videos uploaded from YouTube; and rests with a selectable length. Users might forward material already present on the internet or create their own audio track, image or video and then report the link. Other contents, appearing only once, concern more abstract or compounded data. These involve the selection of one option to apply to the previous action (repeat once, repeat several times, forgot, invert, paraphrase, or vary); a white canvas which can be drawn on with black and white brushes; showing a website; preparing the piano as indicated in a text box; and defining the six actions to be chosen in the other modules.

To facilitate interactions within the website and onset representation, *Wiki-Piano.Net* provides four interrelated web pages, each with a different function. The main editable score on http://wiki-piano.net can be accessed and modified by inserting a random nickname. It is structured in consecutive modules separated by horizontal lines. Each module's top-right corner provides some additional tools: two vertical arrows to move the modules' position up and down; a question mark explaining the module's properties when clicked; and a checkbox, selecting which of the related modules is deactivated.[5] All the edits are stored on http://wiki-piano.net/archive, which allows retrieving previous versions of the score by entering time and date. The archive, also reporting some performances footage, is useful to trace the evolution and show online relationships. Moreover, two other

sites enlighten the performance importance, being specifically dedicated to it: the interface on http://wiki-piano.net/performance, displayed on the pianist's laptop or tablet and showing each module separately as a slide show; the presentation accessible at http://wiki-piano.net/audience, usually projected on the screen next to the performer and recalling the performance overview but with some hidden sections.[6] The 'performance' and 'audience' pages can be synchronised by typing the same time coordinates, hence reacting simultaneously to the change of modules ordered by the performer who pushes a button (usually with the foot).

The mentioned online platforms relate to the mutual relationships between the three subjects outlined in Figure 1: author (A), defining the piece structure and interaction rules; users (U), modifying the score through the website; pianist (P), interpreting what is written on the online score at the current state.[7] The sets embedded one into another highlight the hierarchy behind the piece's definition: owing to the concept, the performance cannot take place without users' editing; in turn, users follow the website's functions previously defined by the author. The same goes for the related references, insofar as programming entails both users' interaction and pianist's performance, and the website provides what to play. Therefore, the piece implies different perspectives implicitly encompassing previous and next phases as concealed functions. The three subjects are bound

[5]Since these are omissible at will, it could be the case of a score strictly made of piano-playing or texts, as well as a piece composed only of the fixed introductory and concluding sections. The latter case is unlikely and has not happened yet.

[6]What is not shown are the actions that are performed, some texts, and how the piano is prepared. In the composite modules in which two typologies of content are performed at the same time, only one of them is displayed, with priority to videos, images and, secondly, to notes.

[7]The pianist can choose the score among those edited around the performance date, establish what to play when not explicitly written and broaden the default media to a small extent (e.g., using a keyboard). By virtue of these narrow margins, he manifests her/his agency through the relationship with the website's score, recalling a canonical interpretative dynamic.
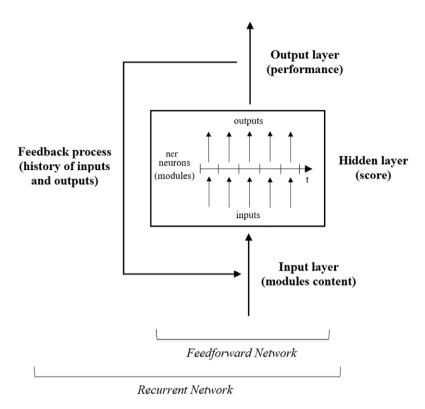
Figure 2. Neural network system as compared with the piece's structure, highlighting a feedforward and a feedback model.

together and contribute to the piece's development in different ways. Digital mediation takes place in programming and online dimensions, whereas stage reproduction mainly involves analogue and physical means. In all these cases, the website is the central entity, changing its affordance due to the subjects and functions involved. The following sections outlines these three dimensions separately.

2. WEBSITE AS SYSTEM

2.1. (Human) Neural network

The author's structuring involves the organisation of the piece as a self-standing entity to be further edited and played, still addressing the intellectual property to himself in a canonical way. His main role is defining the core structure around which the process evolves, entailing all its further implications. Hence, he programs a model based on discrete functions of two kinds: informatics and human.[8] The former regards the website modules encoded in HTML, grouped in categories, and with defined interactive possibilities; the latter requires users and performer to fulfil the system and render its result. The overall process recalls an autonomous computational model in which the

internal components are not only formulas but also users. It is possible to compare *Wiki-Piano.Net* with a neural network due to two other factors: the prominence of programming and bioinformatics in the author's training and poetics (Schubert 2021a, 2021b); and the presence of an internal history entailing performance's videos and previous editing.[9] A neural network involves two main components: the processing elements (neurons) and their connections (links). Neurons receiving stimuli from the outside are called 'input neurons', those producing an external outcome are 'output neurons', and those communicating internally to the system are 'hidden neurons' (Hu and Hwang 2002). Modules' interdependencies correspond to the hidden layer insofar as users provide inputs by inserting contents, and the pianist affords the output.[10] As in neural networks, the hidden layer dynamics emerge only by observing the outcome, hence inferring internal relationships through the website's content. Figure 2 summarises this process, also showing two general kinds of neural networks related to the piece: a 'feedforward' and a 'recurrent' one. The former provides an output

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[8]To avoid bots' participation and too many editings by a single user, the author allows only ten actions every minute.

[9]This analogy fits well with the composer's further experimentation with advanced AI systems in pieces such as *Av3ry*, *Convergence* and *Crawlers* (Schubert 2021a).

[10]Content's relationship occurs not only between subsequent modules but also on a long-range and -period (cf. section 3.2).

depending only on the inputs and the internal process-ing, whereas the latter relates to the memory of the system's inputs and outputs (Zhang and Gupta 2000: 97). Users might modify the score's modules referring to the archive's material or not, respectively recalling one model or another.[11]

The fundamental discrepancy with neural networks lies in the lack of problem-solving, replaced by human interaction and artistic intent. Indeed, Schubert intends specifically to depict online dynamics and, using a Creative Commons licence, aligning to the internet standards as found in the open-source com-munity (Lessig 2004; Schubert 2021b). He also asserts:

> The idea behind this piece is not really to come up with a masterpiece and work together towards that goal, but about showing how people influence each other and what the dynamics in such an environment are. Rather than the performance itself, it is mostly about the development from A to B to C and how it continues. (Schubert 2018b)

HTML encoding and given rules define an adaptive environment not implying a strictly predetermined score (computational or notational) but a field of possibilities linking the modular environment to the audiovisual result. In other words, through the elabo-ration and orientation of contents given by (human) internal components, Schubert is 'composing interac-tions': he 'invents and works out interdependencies among real-time control variables' (Di Scipio 2014: 270).[12] Therefore, from the author's perspective, the input and output are part of the same process.

2.2. Virtual environment

Applying users' agency to a neural network implies the establishment of an interactive virtual environment. Indeed, the editable website respects two of the main characteristics commonly ascribed to synthetic worlds: persistency – where virtual space exists independently from users' editing – and interactivity – as a series of commands that users can execute on the environment (Castronova 2005; Bell 2008). In addition, the pianist might be conceived as an avatar, namely 'one of the central points at which users intersect with a techno-logical object and embody themselves, making the virtual environment and the variety of phenomena it fosters real' (Taylor 2002: 41): even if without the concrete and immediate feedback, some of them may still imagine what will happen on stage. Furthermore, they must insert a fictitious name to interact with the score, creating an online identity dedicated to vir-tual space.

This operative process also relates to 'commons-based peer production' (CBPP) to which the 'wiki' platforms refer (Foote et al. 2017), insofar as

> The networked environment makes possible a new modality of organizing production: radically decentral-ized, collaborative, and non-proprietary; based on sharing resources and outputs among widely distributed, loosely connected individuals who cooperate with each other without relying on either market signals or mana-gerial commands. (Benkler 2006: 60)

The performance might be considered the goal towards which users freely and anonymously collabo-rate, showing the most 'updated' version of the score. Still, *Wiki-Piano.Net* entails interactivity within a well-defined virtual environment, which becomes a media itself. Therefore, the present application of the CBPP in the artistic field determines two problem-atic issues: 1) the clear statement of a single author – implicitly orienting the piece evolution due to his artistic view – and, consequently, 2) the aesthetic dimension, also related to users' interplay and pianist's interpretation. Therefore, the 'wiki' principle also stands as a reference, implicitly orienting the piece's conception. Beyond this surface lies the author, whose poetics emerges precisely in the remediation of virtual environments entangled in contemporary sociocul-tural habits. To this extent, *Wiki-Piano.Net* is not only a social experiment but also an artwork, referring to a concealed as much as a precise aesthetic intent.[13]

Stepping back to virtual realities, the performance does not happen in asynchronous time and at a remote location (Barbosa 2003). This factor excludes an instantaneous reaction to the uploaded stimuli and limits the immersivity principle. Indeed, users partially experience the action's fulfilment on the screen (Bartle 2003; Burdea and Coiffet 2003).[14] The interaction's delayed manifestation is crucial in dividing the score from the audiovisual result: the web platform emerges in two interconnected facets, enhancing the digital remote communication and the pianist's interpreta-tion. Hence, the focus on virtual space and CBPP enlightens how each subject evolves its compositional process within the score. Both author and users equally relate to how the 'rationality of the aims' – as 'individual techniques and particular participatory activities' – relates with the digital 'rationality of the means' – as 'external determination' (Di Scipio 2000: 237): the former establishes the environment

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[11]From a feedback perspective, analytical texts as the present might also provide data entailed in the system, as users read and are influenced by them.

[12]The scholar defines this concept in contrast to 'interactive composing', as present in Chadabe's work. To a restricted extent, 'simultaneously composing and performing by interacting with … system as it functions' (Chadabe 1984: 23) might relate to the modules' preview.

[13]Kanga states the author's aesthetic intent as well, inferred from his field perspective as a performer (Kanga 2021: 237).

[14]Inputs receive an immediate ('synchronous') feedback (Barbosa 2003; Bell 2008) only at the score level, insofar as the modification happens in real-time and users can both read what is written and hear/watch what is edited by pressing the 'play' button.

```
<select class="ToggleInput form-control" id="SingleAction1">

    <option class="ActionChoices" data-action="action-a" value="action-a"  selected="selected" >Orgasmic moan</option>

    <option class="ActionChoices" data-action="action-b" value="action-b" >Play Charpentier&#x27;s Te Deum </option>

    <option class="ActionChoices" data-action="action-c" value="action-c" >Say something blasphemous</option>

    <option class="ActionChoices" data-action="action-d" value="action-d" >Play &quot;Shallow&quot; by Lady Gaga</option>

    <option class="ActionChoices" data-action="action-e" value="action-e" >Twin Peaks Laura Palmer Hand Gesture</option>

    <option class="ActionChoices" data-action="action-f" value="action-f" >Repeat last action but bigger</option>

  </select>
  </div>
</div>
<div class="col-5">
  <div class="input-group align-items-center">
    <div class="input-group-addon performance-length">
      <span id="SingleAction1-slider-value">
        3
      </span>
      <span>&nbsp sec</span>
    </div>
    <input class="ToggleInput slider" id="SingleAction1-slider" type="range" min="0" max="30" value="3">
```

Figure 3. Website source code, excerpt showing the selection of one of six actions (on top) and its duration (on bottom).

and its parameters, weighted towards further interactions (following a bottom-up approach); the latter, instead, interplay with and within the website, consequently interconnecting with each other (after a top-down perspective). Even if this shared environment develops over time, the outcome – as much performed as viewed on the website – affirms a univocal text. Each score reflects one state of the website, as a point in time implicitly connected to its future implications. Instead, on the single score level, users change the temporal flow and the meaning of upcoming data by modifying one module. Therefore, if the performance and website freeze a given state of unfolding contents, the editing via the internet determines a formalisation concurrent to real-time decoding. This moment locates in the middle of the bottom-up and top-down approaches, where the preset environment is not yet fulfilled and the website editing is still to come. The creative connection between users and author occurs in these infinitesimal periods, continuously bringing to both the defined scores and evolving processes.

3. WEBSITE AS SCORE

3.1. Website syntax

The second structural layer is the editing, entirely dependent on users. As an editable score, the piece involves the re-definition of pre-existing contents insofar as 'new digital media are not external agents that come to disrupt an unsuspecting culture. They emerge from within cultural contexts, and they refashion other media, which are embedded in the same or similar contexts' (Bolter and Grusin 2000: 19). The author bases these principles on virtuality:

the question of virtuality and deception is, in fact, such an integral part of electronic working methods that it can never be eliminated. The sole question arising concerns the form in which this fact is addressed and made part of the piece's content ... But besides the technical and craft components, each design and mapping proclaims its own reality, causality and logic. A black box set of rules is established, to which the viewer must relate, regardless of how easy or difficult its components are to understand. (Schubert 2021b: 206–7)

These 'black box set of rules' are organised through a pre-existing HTML syntax and partially fixed modules.[15] According to the properties of new media listed by Lev Manovich, digital encoding implies a numerical binary representation, a modular structure and infinite replicability (Manovich 2002: 27–48). The internet, consisting of separated objects for each code line, explicitly relates to 'overabundance of information': arranging 'the world as a non-hierarchical system ruled by metonymy', the 'hypertext of the World Wide Web leads the reader from one text to another, ad infinitum' (Manovich 2002: 65-77). Insofar as *Wiki-Piano.Net* works as a software agent collecting and limiting the massive amount of available data, it manifests both given borders and a clear relationship with referenced online dynamics. The observable modules' segmentation reflects the performance rendering as blocks, clearly separated from each other and arbitrarily replicated. Within them, each content entails hypertextual functions. Figure 3 shows the source code plain text of one

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[15]The Django templating language dynamically includes all the necessary elements in line with the piece's temporal evolution. Additional information about the website source code has been retrieved via email on 7 January 2021, thanks to the programmer Osterried.

action. The first lines indicate all the actions previously defined by users – in this case, 'Orgasmic moan' is selected – whereas the last line highlights the numerical values (from 0 to 30 seconds) attributed to the slider – regulated to establish the action's duration.

The piece's development thus entails both the concept of metadata – as 'data about data' (Buckland 2017) – and hypermedia – as 'windows that open on to other representations or other media' (Bolter and Grusin 2000: 34) – respectively when the material is composed directly on the website (e.g., texts, piano scores and actions) or it references other online environments. In both cases, the modular structure defined by the author surpasses pre-existing meaning and includes them in the overall concept: the website as a score determines a third-order mediation as a superimposed text. This conceptual framework is also observable by the piece's articulation, where the online interaction and modules' editing occur mainly in the middle part. On the other hand, the introductory text and the last part are fixed and scarcely editable: this stands both for the concept's statement at the beginning and for the final section – including the piece's statistics, users' opinions (written or by video) and some pianist's considerations. In both cases, the author establishes the internal narrativity, letting one subject or the other express.

3.2. Online interaction

The score is the only support to overview the online interaction. Contents refer to an ambivalent conception of the internet: as a virtual space hosting self-contained cultures and as a cultural artefact with implications dependent on the offline context in which it is used (Hine 2000: 14–40). Even if users' anonymity does not allow them to overview the latter process in detail, it is inferable that recurrent patterns come from external web environments' habits and languages, evolving within the piece with their own rules. This statement enlightens a significant analogy with the 'memes' principle, as '(a) a group of digital items sharing common characteristics of content, form, and/or stance, which (b) were created with awareness of each other, and (c) were circulated, imitated, and/or transformed via the internet by many users' (Shifman 2014: 41).[16] Memes provide a recognisable format, established within online communities and re-adapted according to other contexts. Hence, they are useful tools to analyse the interconnections happening in

the hidden layer.[17] In addition, 'as they're applied in vibrant contexts at varying levels of individual and group communication, memetic texts help "the Internet" – though it is a multiplicity of texts, sites, perspectives, and experiences – feel more like "a place"' (Milner 2016: 33–4). In this regard, *Wiki-Piano.Net* becomes a normative 'place' with a shared language, thus referring to an online community.[18] The composer has no role in the interactive dynamics and languages arising among users: he can interact, if anything, as a user, becoming part of the online community himself.

According to peer-production studies, three categories of users are observable: those who do not participate and overview what happens on the website ('lurkers') (Preece et al. 2004; Ebner and Holzinger 2005); those who contribute at the first attempt and then leave the platform (Panciera et al. 2009); those who collaborate towards a goal even without knowing each other.[19] These cases are all evaluated as beneficial to the community definition (Armstrong 2018; Rappaz et al. 2018), but they are differently linked to the formal and the social dimension: occasional participants relate never or rarely to other modules' content, whereas persistent ones establish virtual microcommunities around recurrent subtopics. Common patterns can be associated with a short- and long-range or short- and long-period reference. According to this statement, relationships have been classified in these four cases:

1. Within the same module: a module maintains some of the previously uploaded elements, generating an internal evolution of the content (Figure 4).
2. Between different and close modules, in short periods: contents are repeated in the neighbour modules to create continuity.

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[16]The term was coined by Richard Dawkins in the text *The Selfish Gene* (Dawkins 2006), which discusses the concept as a replicable information entity concerning a genetic process and evolutionary context. Shifman's theory, on the other hand, constitutes a significant contribution more closely linked to the online communities.

[17]Kanga even proposes a 'model for a memetic analysis of other interdisciplinary music by single composers' (Kanga 2020: 19). However, he uses memes as tools for categorisation rather than structural elements.

[18]Online communities are generally identified as 'a group of people who share social interaction, social ties, and a common interactional format, location or … a computer-mediated or virtual "cyberspace"' (Kozinets 2010). As discussed, 'social interaction' and 'social ties' are inferable in relation to the similarities of the modules' content.

[19]The website's statistics concerning users' rate of interaction – kindly provided by Schubert and Osterried on 5 March 2020 – show an overall decreasing number of participants while the overall duration of visits is constant, and the average duration of returning visitors arises. These aspects highlight the growing importance of regular participants, determinant in the establishment of shared community knowledge. Furthermore, the occasional users' relevance is confirmed by the high bouncing rate (58%). These different roles also recall a spontaneous hierarchical organisation, similar to the internal dynamics of Wikipedia (Jemielniak 2014).
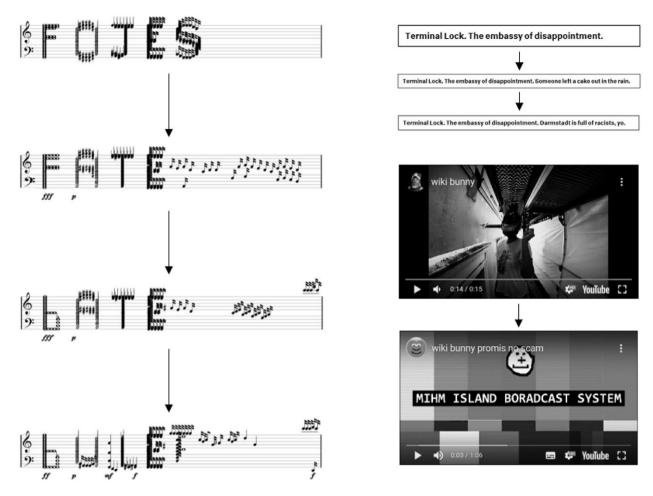
Figure 4. *Wiki-Piano.Net* score excerpts, interactions within the same module over time in relation to scores, texts and videos.

3. Between different and distant modules, in short periods: contents are repeated in modules located at least two modules afar (Figure 5).
4. Between different modules, in long periods: similar contents are recurrently found over long periods.

The first two cases can indicate occasional interactions, whereas the others manifest greater attention to the formal structure. Generally, it is inferred that the more the same content is modified or quoted over time, the more a community process occurs. This principle can be related to a formal cyclicity generated by short-term relations (second and third case) or even to the emergence of a distinctive language born within the piece (fourth case). Long-period recurrent topics might emerge from within the piece (e.g., the word 'unless' and the ceramics topic) or come from web environments external to it (e.g., the 'dab' move and the reference to cats for ironic purposes).[20] In addition, it is possible to notice alternative uses

of the score's offered possibilities. For example, the categories' default topics are frequently mixed, as texts created through notes shown in Figure 4. This conceptual shift indicates a creative process specifically concerning users and implying their assimilation of the given elements. Questioning given rules and establishing new ones, the community progressively affirms its identity as a unified system that continually redefines its nature.

4. WEBSITE AS INSTRUMENT: PERFORMATIVE DIALECTICS

The final step of the processes is the performance, which also regards the musician's participation. At this stage, the audience perceives the dynamic interaction between the different contents and their relation through the reproduction media. To a broader extent, the website might also be conceived as a digital instrument played by the performer: similar to a 'multi-users instrument' able to evoke several instances of itself (Barbosa 2003: 55), it allows a single user, rather than many users, to play through a previously shared

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[20]These considerations refer to my own survey of the website, Schubert's documentation (2018b) and Kanga's analysis (2020).

unless

unless unless unless unless unless unless unless unless unless unless unless unless unless unless unless unless unless unless

no piano fate unless

unless unless unless unless unless unless unless unless unless unless unless unless unless unless unless dr orrett unless unless unless unless unless unless unless unless unless unless unless unless unless unless unless many hackers in china unless unless unless unless unless anushi unless unless unless unless unless unless unless unless unless unless unless unless unless unless unless unless UNLESS?!?!

Time. unless.

Imagine all the people unless you're a robot

The only   face of   fear, and   my self

destroys   every sign unless unless unless unless unless unless unless   Perform   blink eyes   ▼

Listen unless you're tender

SHALL NEVER BE DEFEATED unless

Unfinish a symphony ; the code is   by   nothing up side down backwards forward; upup downdon, leftright L r AB

times I ever feel   fear, and   horror are when my stolen furry pen

the paper's *scream* code! :+]   Perform   play major chords   ▼

-No. The horse's code I shall remember.
-Remember you?
-You played Street Fighter...
-Errathumanus est NES
- Test-ing the code
The code won't work...

Figure 5. *Wiki-Piano.Net* score excerpts, interactions within different and distant modules in short periods. It highlights the recurrence of the themes for the words 'unless' and 'code', respectively, referring to the scores of 24 April 2018 (7:42 pm) performed by Zubin Kanga and 5 October 2019 (12:00 am) performed by Matthias Halvorsen. Modules are not strictly consequential as they appear.

editing. This conception creates two interpretation levels: the audiovisual perception, involving the relationship between the analogue devices and acoustic-gestural enactment; and the intermedia supports, which relate to the website architecture including all the uploaded contents. To clarify this statement, it is possible to recall the categories defined by Simon Emmerson to describe the different links between live musician and machine. According to his perspective, the digital instrument might be a 'strictly separate entity generating an independent musical stream'[21] or an extension of the human body 'autonomous

but … integrated with the original human performance action and perception' (Emmerson 2009: 169–70).

Starting from the latter, the website might be conceived as a digital instrument involving heterogeneous expressive possibilities related to the modules' content. As Garth Paine notes, the gestural process concerning a canonical acoustic performance can be extended to

[21]The category's second paradigm – about the computer as a (near) performer's clone – has been considered not tailored to the present piece.

Figure 6. Performance by Zubin Kanga (5 May 2018, University of London), excerpt showing the stage setting.

the electronic dimension, where devices and interface design exhibit a gestural language used to engage with the instrument. Consequently, the resulting affordances are sufficiently convincing to express a renewed 'embodiment relation' (Paine 2009: 221). *Wiki-Piano.Net* respects these aspects at a very basic level, insofar as the musician directly activates each module by pressing a button (the click of which is most often clearly audible) and plays the material visible on the projection screen. The visual feedback directly reflects the performer's expressiveness by 'showing some of the components of the instrument … or presenting metaphorical images that illustrate the principles on which the instruments are based' (Arfib et al. 2005: 127). Finally, he also decides when to conclude each module by starting the next module. In other words, the musician interacts with the digital body of the instrument by recalling the attack, sustain (as sound-image coincidence) and release gestures. It is also possible to infer a strict relationship between the software structure and the piece development: the digital instrument embeds the score (Jordà 2004: 324), in as much as the score reflects the system. Therefore, the performance implicitly gathers all the three fundamental dimensions stated at the beginning of this article, perceived in a reverse hierarchical order – the pianist playing the instrument, the users connecting and interacting through the score and the author programming the website – still emerging as a single unit.

On the other hand, the work's enactment involves a perceptual dichotomy between what is performed by the pianist and what analogically reproduced, establishing a permeation between human and machine. The website representation is interwoven with the piano reference and supported by speakers and projection screen, leading to an onstage dichotomy between acoustic-gestural and analogue-mediated reproduction. The (so far) most common disposition of acoustic and analogue instrumentation (Figure 6) also evidences this distinction on a visual level, leading the viewer to focus on the piano or the screen. Therefore, the reception of different kinds of materials is closely linked to the media involved, according to a dichotomy recalling the 'instrument + tape' format. The acoustic and analogue reproduction are respectively extended to verbal and gestural expressiveness – in texts and action enactment – and to the screen – projecting not only images and videos but also websites, duration bars and titles according to a slide-show dynamic. The symbiosis between media may occur in different ways, related to the guidelines given by the author.[22] As presented in Table 1, the acoustic/gestural and analogue supports' distinction is clear only in titles, soundtracks and referenced

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[22]As already mentioned, these can be accessed by clicking on the question marks next to each module. Table 1 reports mainly these indications, except for significantly recurrent accompaniments observed so far.

Table 1. Analogue devices and acoustic/gestural enactment related to the contents' reproduction as indicated by the author, highlighting the actions involving the pianist (P) and the overall editing concerning users (U)

	Website (U)			
	Acoustic/gestural (P)		Analogue supports	
	Piano-playing	**Acting/reading**	**Speakers**	**Canvas**
Titles				✓
Texts	(✓)	✓		(✓)
Musical notes	✓			✓
Actions		✓		Duration bar
Rests				Duration bar
Soundtracks			✓	
Videos	✓		(✓)	✓
Images	(✓)			✓
Website				✓

Note: Checkmarks in brackets show reproductions that are optional (videos' sound) or not always provided (texts' projection), or commonly played accompaniment not explicitly requested in the score.

website. Instead, texts and piano staves may be shown on the canvas; actions and rests provide their length's projection; and videos are coupled with the pianist's played interpretation as, at times, to images. Of course, these mixed relationships can be further complicated where different contents are coupled in the same module, making the boundaries between physical, analogue and digital ever more subtle. The most recurrent outcomes are played and projected contents. Therefore, media do not remain restricted to their canonical function but, once more, become a more general representation of the main concepts: the piano reference on the one hand and the users' interaction on the other. The author, at this stage, remains the most abstract entity, acknowledged as the artistic creator but perceived as detached from any further dialectics.

5. CONCLUSIONS

The central aspect of *Wiki-Piano.Net* is the website, implying not only the community interaction expressed by the composer but also the previous system definition and the further enactment. The remediated contents and the historicised piano reference merge within a well-defined – although open – form, which evolves through different stages. First, the website's digital encoding concerns the modules' fragmentation, the content's treatment as unified data and recurrences in short- and long-range and in short- and long-period. These assumptions define tangencies and permeations between contents and subjects involved, also indicating a closed system projected beyond its borders. Indeed, the dynamical structure of the piece implies an emerging community, relating to other web environments and developing a specific language within itself. Virtuality becomes

essential to explore the available resources and make them socially relevant through digital mediation. Moreover, the conceptual statement initially presented embraces a formal development implied in the system itself and provides a delayed enactment. The former dimension highlights the composers influence, whereas the latter shows significant analogies with mixed music performances. Furthermore, the authorship attribution and the score interpretation root the piece on the intermedia staged repertoire, which reflects significant tangencies with the past while also entailing interconnections with other web-based or digital references. The various stages also show different perspectives, from which the other subjects change role and relevance. In the intersections of the various aesthetic angles and dialectical relationships involved – which are not univocally definable – *Wiki-Piano.Net* finds its *raison d'être*: grounded in Schubert's poetics and, therefore, questioning borders between established environments digital instances, and human beings.

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