

When Media Archaeology Meets Maker Practice: The Trans-disciplinary Design of Flower of Time - Universal Correspondence

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Abstract

By integrating a notion of ‘Media Archaeology as artistic methodology’, *Flower of Time: Universal Correspondence* is a new media art work that explores how digital technology could transform the experience and aesthetics of a mechanical clock. Utilizing various digital techniques such as real-time image processing, 360-degree panoramic projection, electro-mechanical installation and digital fabrication, *Flower of Time: Universal Correspondence* was exhibited in Room 108 at National Taiwan Museum of Fine Art (NTMFA) between 18 August to 21 October in 2018. This paper illustrates the design concept, technical details, exhibition documentation of and the reflections on this project. By incorporating an idea of ‘Media Archaeology meets Maker Design’, this paper intends to demonstrate the potentiality and richness of such spirit that enables the makers to creatively explore the unrealized dreams in media history.

Key words: Media Archaeology, Maker Practice, Trans-disciplinary Design, New Media Arts, Technological Arts

Introduction

Media archaeology is a research orientation interested in the forgotten paths and the techno-historical cultures of past media technologies. It aims to construct alternate histories of suppressed, neglected and forgotten media that do not point to the present media-cultural condition. In recent studies, the media thinkers have shown an increasing ambition to develop the practical facets of media archaeology. For example, Parikka [1] suggests that media archaeology need to articulate its relation to art and design practice more clearly. This notion proposes that media archaeology moves from a research agenda on the margins of media studies to being a cultural and material practice. Adopting Parikka’s notion, this research explores the potential of applying media archaeology as a practical and critical method for Maker practice.

There are several problems in recent Maker activities: the highly commercialized Maker Faire, the loss of original spirit

of the Maker movement and the homogenization of novelty caused by the popularization of Maker tools. In order to re-embrace Maker practice as a knowledge exploring method, this research focuses on the media archaeology of European mechanical clocks and excavate several unrealized dreams for critical design. The following sections will describe the methodology, design concept and technical detail of *Flower of Time: Universal Correspondence*, a new media art project that integrates media archaeology and Maker spirits.

Methodology

This research includes a methodology of Media Archaeology, and practice-based research:

A. Media Archaeology

Media archaeology, as a unique perspective toward media archiving, generally follows Michel Foucault’s genealogy of knowledge in *Archaeology of Knowledge* (1970). Foucault analyzes the process of knowledge formation, explores the influences of power and rules behind, and suggests that systems of thought and knowledge are governed by rules which operate beneath the consciousness of individual subjects. Archaeology for Foucault is not about ‘contextualizing the historical narratives’ but a way of critical discourse. Media Archaeology also adopts Friedrich Kittler’s investigation of media and technology in *Discourse Networks 1800/1900* (1985). Kittler presents an original work about the connections between historical moment, social structure, technology, communication systems, and what is said and thought using these systems. For contemporary media researchers, media archaeology is a potential orientation to creative material intervention, since: “Media in its various layers embodies memory: not only human memory, but also the memory of things, of objects, of chemicals and of circuits.... Media is itself an archive in the Foucauldian sense, as a condition of knowledge, but also as a condition of perceptions, sensations, memory and time” [1, pp. 425–427]. This research adopts the method of media archaeology as an investigative orientation into historical technological media following a certain creative intention (e.g. to develop a more critical method for Maker practice).

B. Practice-based Methodology

This research also adopts a practice-based methodology in which the claims of originality and contribution to knowledge are demonstrated through and with creative outcomes [2], [3]. The purpose and significance of this study is described by text, however it must be understood by referring to the results of the creative practice. In this process, the design and exhibition of work is not only for aesthetic appreciation but a reflective process to clarify research proposition as well as gain feedback from the audience. Under the criteria of such practice-based methodology, this paper has an indexical relationship [4] to the artefacts of *Flower of Time: Universal Correspondence*. Critical analysis of technologies and techniques are reflected with making and through making. This research is consisted of three phrases: Firstly, a media archaeological review of European mechanical clocks is conducted to clarify design problems. Secondly, according to the above problems, we develop new techniques and artistic approaches for designing an installation in NTMFA. Finally, through audience feedback, documentation and reflection, this research argues media archaeology can be incorporated with Maker tools and explores the potential of such practice.

Design Concept

Calendars were important to ancient societies for timing agricultural activity and fixing religious festivals [5]. Clock mechanisms, or astronomical mechanisms, were designed to predict astronomical positions and eclipses for calendar. Antikythera Mechanism is now considered the oldest astronomical calculator constructed by Greek scientists between 150 and 100 B.C. [6]. Antikythera Mechanism is a mechanical realization of ancient Greek astronomer Hipparchus's theory of irregularities of the Moon's motion caused by its elliptic orbit. In the past, Eclipses and planetary motions were often interpreted as omens, while the calm regularity of the astronomical cycles have been philosophically attractive in an uncertain and violent world [6]. The mechanism was sophisticatedly designed to accurately predict upcoming astronomical event, as well as to realize the idea of 'regularity' of celestial bodies.

The Prague Astronomical clock, or Prague Orloj (Figure 1), was first installed in 1410 which is the oldest astronomical clock that is still operating. The clock mechanism has three main components: "The Walk of the Twelve Apostles" (on the top), the astronomical dial (on the middle), and a calendar dial (on the bottom). In addition to its astronomical mechanisms, the clock has displayed a more religious and philosophical ideas using animated figures. There are four figures flanking the clock which are set in motion on the hour, and represent four things that were despised at the time of the clock's making — Vanity, greed, death and lust. The Walk of the Twelve Apostles is a representation of Christ's disciples at the doorways above the clock, where each can be recognized by his attribute (e.g. St. Peter carries a "key" while he is considered the first of the apostles and the first pope in the history of the church). The design and setting of the Prague Astronomical clock made imageries that were mechanical and scientific inseparable from the religious and metaphorical. It was this kind of 'hybridization' that directed the discourse of

teleological worldviews in the following centuries [7, p. 162]. By 'hybridization' I mean it was the specific design and installation setting of the artefact that allowed it to embody diverse meanings and discussions in different disciplines. The Prague Astronomical clock, like other clocks constructed before and after, is considered a magnificent achievement in medieval engineering, as well as a cultural landmark whose symbolism, design and aesthetics are remarkable in human's history of technology.



Fig. 1 Prague Astronomical Clock photographed by Steve Collis, dated 26 September 2012.

Base on the archaeological review on the above two mechanisms and others, two ideas emerges: Firstly, the design idea behind the clock mechanism evolves through time. The idea has been shifted from 'prediction of celestial events', and 'representation of regularity of celestial bodies' in 100 B.C. to a more moralistic or 'vanitas' theme in later Middle Age Europe. In 100 B.C., the clock works were presented as a symbol for order, rationality and predictability which was lacking in reality. Clock works designed in later Middle Age Europe embodied much moralistic idea from Christianity and were meant to remind viewers of the transience of life, the futility of pleasure, and the certainty of death. Moralistic messages were symbolized in the mechanical and figurative design of the clock mechanisms.

Secondly, following the premise above, the design of our daily-used clocks is lacking. The daily-used clocks are made for giving the correct time, however according to our review, much of the precious qualities of a clock mechanism is missing. The clock mechanism is never an artefact that only tells time. The cultural and technological context of such clock-making, the relationship between clock-making and other activities, the shifting intention of clock-making in human history should all be critically considered through design. Therefore, this research proposes that the design of a contemporary clock mechanism must be directed by the revolution of cross-disciplinary knowledge, such as the juxtaposition of engineering, aesthetics, and the social-cultural context behind. Looking back at our contemporary world, technological development increasingly affords more flexible material conditions for designing artefacts that support a variety of

aesthetic qualities in the interaction. The researches on ‘aesthetic computing’ [8] ‘ubiquitous computing’ [9] and ‘physical visualization of information’ [10] have largely influence contemporary industrial design and related studies. The design of artefacts now concern more about how it embodies the aesthetic potentials between technology and human beings. As a result, various researchers have emphasized the need for addressing aesthetics of interaction that go beyond narrow usability issues. This aesthetic concern suggests further exploration into the awareness of the user as a sensing and emotional human being, the interface as a unique design material, and the various social-cultural context behind the design.

As a result of the media archaeology on clock mechanisms, this research proposes two characteristics for designing a contemporary clock:

A. Responsive Movements of Serenity, Wisdom and Peace

The later Middle Age European clock as mechanism of divinity showed that technology could not only be metaphorized as a regular pattern of organic life, or work as an emblem of human intelligence, but also through a specific design, could be a critical material form that allowed the revelation of the transcendental or the ultimate. Observing a clock mechanism could be considered participation in ultimate reality, for it shared the nature of self-subsistent being, and the clock “prompts us to imitate those movements of serenity, wisdom and peace in our souls” [11, p. 67].

B. The Richness and Vividness of Every Single Moments

The mechanical clocks in history embodied the idea of ‘regularity’ of our universe. However, limited by the technologies then, the clocks could not present the uniqueness of every single second. The idea that ‘time never comes back’ seems also lacking in the past design. How to incorporate such idea in a contemporary clock design and how such design can fulfill our aesthetic needs are considered critical in this research.

Technical Detail

Flower of Time: Universal Correspondence is a new media installation that is constructed to realize the two design concepts above. The visualization of flower is adopted in the design to reference to an old poem reminding human ‘to see a world in a grain of sand and a heaven in a wild flower...’. Utilizing digital tools, it is composed of 360-degree panoramic projection and an electromechanical sculpture at the center of the space. In order to show the uniqueness and richness of every single moment, *Flower of Time: Universal Correspondence* is designed to map the time digits into occurrent phenomena, including the color, formation, and layer of flowers.

A. 360-Degree Panoramic Projection

The 360-degree panoramic environment is made up of 10 flowers (Figure 2). Using *Processing* as programming tool, we design sketches that can calculate each of the flowers’ colors and layers by the time digits at the moment. The hour, minute and second digits were translated into values for hue, saturation and brightness (HSB) respectively using simple

algorithms that calculate and map the time digits. The flowers have more than 20 layers that slowly moved forwards and backwards at z depth, and rotate in different speeds and directions. The front petals overlap the ones in the back to create a visualization of vividness and richness. The methods the colors are created are also displayed on the wall for the viewers (Figure 3).



Fig. 2 The 360-Degree Panoramic Projection of *Flower of Time: Universal Correspondence*, Photographed from the control room of Room 108, NTMFA.

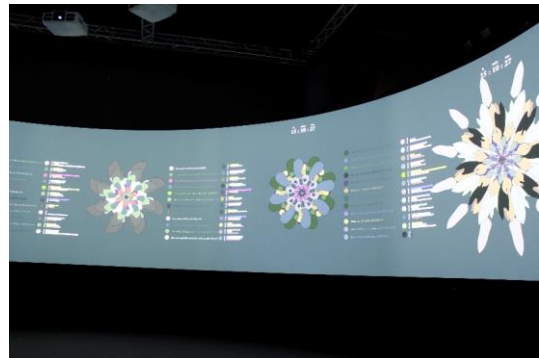


Fig. 3 The real-time generated flowers and the algorithms displayed on the wall of Room 108, NTMFA.

B. Electromechanical Installation

The electromechanical installation is a mechanical flower constituted of five layers: second, minute, hour, day and month. The mechanical flower is assembled with laser-cut acrylic sheets, stepper motors (42BYGH60), timing belt, screws, nuts and 3D printed sliding-tubes. The mechanism is controlled by an Arduino UNO R3 board connecting to 5 motor drivers (TB6560), and is hanged at the center of the space by metal wires (Figure 4). The mechanical flower is also running according to the time data. It indicates the time by opening up and close down the petals. For example, the layer of second ticks every two second and completes its circulation in a minute. It expands outward as it goes from 1 to 30 and shrink back between 31 and 60. Likewise, the layer of month ticks once per month and completes its circulation in a year.

Each layer also has a correspondent color hue that represents the time digits. This is achieved through color lights projection from the top of the sculpture. The time digits are mapped into color hues according to their shared circularity. In terms of hours that went from 1 to 24, the color hue changes gradually from red, through yellow, green, cyan, blue, magenta and back to red. The same mapping technique is

applied to all six layers. (see Figure 5 for the color mapping scheme). By projection mapping, the mechanical flower thus shows each moment with a unique color set and formation.

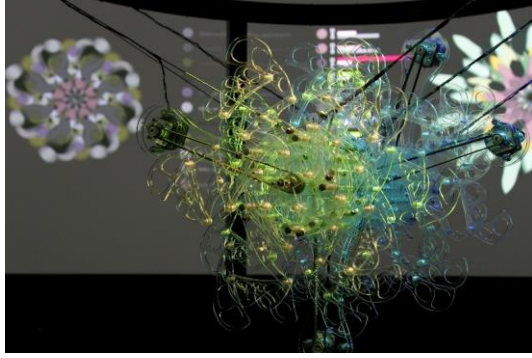


Fig. 4 The mechanical flower of *Flower of Time: Universal Correspondence*, Photographed at Room 108, NTMFA.

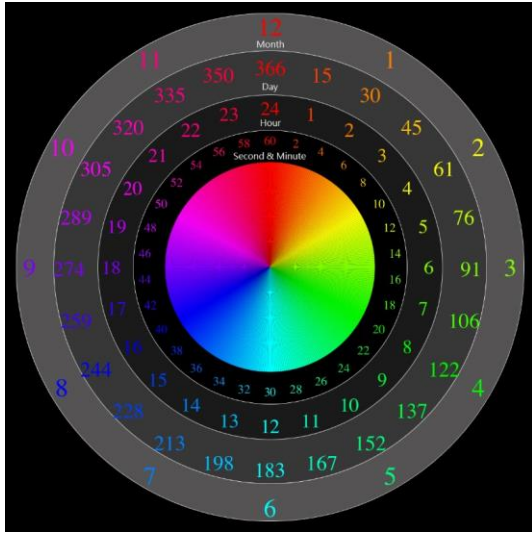


Fig. 5 The color mapping scheme of the mechanical flower. Image drawn by *Processing*.

C. System Integration: Performance Mode

In addition to the ‘Clock Mode’, *Flower of Time: Universal Correspondence* also runs ‘performance Mode’ on every hour and half hour. The Performance Mode is a continuation of the performance function of canonical clock mechanisms. Under Performance Mode, the 10 flowers on the wall turn monochrome and the space turns darker. The mechanical flower’s color become united, showing the circulation of color hues. The five layers run simultaneously, performing motion rhythmically and vividly. The Performance Mode lasts 3 minutes and then returns to Clock Mode automatically.

Analysis and Results

Exhibited in NTMFA between 18 August to 21 October 2018, *Flower of Time: Universal Correspondence* received good response for most audience and media. The work was reported by more than ten online media and blogs and interviewed by a newspaper column. The method of media archaeology is proven to help the artist/designer construct abundant knowledge and guide the artist/designer to making meaningful artefact. The presentation of the artefact as a new media art installation also promotes the artist/designer to think

creatively, and explore deeper about the aesthetic potential of the relationship between technology and people. Through a trans-disciplinary method of media archaeology, maker practice and artistic installation, this research presents a new media art work that is abundant in cultural-historical context.

Conclusions

In recent studies of Maker activities a few common concerns are discussed, including the highly commercialized Maker Faire, the loss of original spirit of the Maker movement and the homogenization of novelty caused by the popularization of Maker tools. That is to say, how to re-embrace Maker practice as a knowledge excavating activity needs more consideration. Through an investigative approach of media archaeology, technical development adopting Maker tools and artistic design of an exhibition in NTMFA, this research illustrates a possible path toward such objective. We believe that making is a unique means for human to reach new knowledge. A trans-disciplinary method of making may generates even more creative design. Thus, for future researcher and practitioner of Maker practices, this research suggests that we should deal with the phenomena of current technology, as well as re-engage the technologies in the past. The practice of Maker tools such as laser cutter and 3D printer can also embody a more media archaeological and aesthetic intention. That is, the exploration of our dreams and fantasies by uncovering the heterogeneity and multiplicity of historical technologies.

References

- [1] G.Hertz and J.Parikka, “Zombie Media: Circuit Bending Media Archaeology into an Art Method,” *Leonardo*, vol. 45, no. 5. pp. 424–430, 2012.
- [2] L.Candy, “Practice Based Research: A Guide,” *Univ. Technol. Sydney*, 2006.
- [3] A.Seago and A.Dunne, “New methodologies in art and design research: the object as discourse,” *Des. Issues*, vol. 15, no. 2, p. 11, 1999.
- [4] J.Bowers, “The Logic of Annotated Portfolios: Communicating the Value of ‘Research Through Design,’” in *Proceedings of DIS2012*, 2012, pp. 68–77.
- [5] J.North and R. W.Smith, “The Fontana History of Astronomy and Cosmology,” *Ann. Sci.*, vol. 52, no. 6, p. 624, 1995.
- [6] T.Freeth *et al.*, “Decoding the ancient Greek astronomical calculator known as the Antikythera Mechanism,” *Nature*, 2006.
- [7] P. Y.Li, “Toward 21st Century Wundermaschinen- A Practice-based Inquiry Developing Media Archaeology as an Artistic Methodology,” Newcastle University, 2017.
- [8] P.Fishwick, *Aesthetic Computing*. MIT Press, 2008.
- [9] G.Bell and P.Dourish, “Yesterday’s tomorrows: Notes on ubiquitous computing’s dominant vision,” *Pers. Ubiquitous Comput.*, vol. 11, no. 2, pp. 133–143, 2007.
- [10] L. E.Holmquist and T.Skog, “Informative Art: Information Visualization in Everyday Environments,” in *Proceedings of the 1st international conference on Computer graphics and interactive techniques*, 2003, vol. 1, no. 212, pp. 229–235.
- [11] C.Moevs, “Miraculous Syllogisms: Clocks, Faith and Reason in Paradiso 10 and 24,” *Dante Soc. Am.*, vol. 117, pp. 59–84, 1999.