

Reimagining Japanese Zen Garden with wave simulation

Eiji Sumi and Peter Nigel Power
Department of Design and Planning
King Mongkut's Institute of Technology
Bangkok, Thailand
eiji.sum@mail.kmutt.ac.th, peternigelpower@gmail.com

Abstract— ‘Reimagining Japanese Zen Garden with Wave simulation’ is an interdisciplinary research project that explores the art of Japanese garden making and its modernity demonstrated through the researcher’s evolving practice of art-science as a contemporary artist. A garden is a unique place where nature and humans meet. Instead of being the conflict, it seeks the harmonious amalgam of co-existence. This project aims to investigate nature and artificiality in the frame of the Japanese garden, how the experiences of beauty in nature differ from the beauty of artificially modified nature, how Japanese Zen rock garden exploits the inanimate objects and minimal aesthetic, and how the visionary who applied their own interpretation beyond the traditional method of garden making as creators. In this paper, historical analysis of Japanese garden’s evolutions, the theoretical structure of phenomena of water wave formation and interference, mechanical analysis of wave generator, and computer simulation’s scenographical visualization, all used together as methods for exploring to re-imagine the new form of Japanese Zen garden.

Keywords—*Contemporary Art, Wave Simulation and Visualization, Art-Science, Nature and Artificiality, The modernity of Japanese Garden.*

I. INTRODUCTION

In the short story of Italo Calvino’s ‘Reading a Wave’, the protagonist, Mr. Palomar stands on the shore, looking at wave’s divergence and convergence restlessly to reduce his relations with the outside world [1]. In the Japanese rock garden, its minimal arrangement of the rocks and the gravel lingers with the serene voice of ripples and waves in contrast. François Berthier says ‘By reducing the nature to its smallest dimensions, one can extract its essence of nature that the human being can discover his own original nature’ [2, p5-6]. Garden may elicit various spaces and functions with embracing the environment of co-existence of nature and human. ‘Japanese garden uses nature as a prominent motif, yet its usage of rocks to express the eternal theme of the existence and the cosmologic relationships between the universe and humans’ [3, p. 2]. With an aim for designing the new form of Japanese Gardens, this paper scrutinizes the cultural and historical context of garden making, the various styles of the gardens, traditions, evolutions, and prominent figures who modernized Japanese gardens. The remaining chapters in this paper explore the aesthetics and materiality of wave, the core concept of Co-existence of nature and human through the concept design, methodology, and prototype visualization.

II. JAPANESE GARDEN

A. Introduction

The Japanese garden’s tradition has a long history with particular styles with a sense of Japanese aesthetics and symbolism and it is structured with meticulously selected waters, rocks, and plants located in small geomancy of garden spaces with reduction of unwanted objects and ornaments. The characteristics of the garden contain tranquil and spiritual qualities, and sometimes, Zen Buddhist gardens are specifically designed to stimulate meditation.

B. Roots, Influences and styles

The roots of rocks in Japanese gardens can be found as early as the first or the second millennium BCE in Jomon stone circles in the North of Japan. Unobtrusive rock protruding vertically in the center of radial horizontal stones. (Fig.1) This arrangement of rocks was the reverberation of ancient Shinto religious belief which the gods inhabit in nature or things, including rocks, and other inanimate objects [2]. Nonetheless, with every evolution of the Japanese Garden’s history, this theme of spirituality in the inanimate object of nature has stayed as the prime theme of the Japanese Garden through history.

History of Japanese garden acknowledge and attorn influences of religion and painting of its neighboring countries through transforming the painting image into the microcosm of the garden space. Jodo-style garden (Nara period ~) shares the Hindu Buddhist cosmology of Mount Sumeru translated from the painting of mandalas as the form of cosmic diagrams by locating the rock in the large water pond as its representation. (Fig.2) Aristocrat tried to recreate the mandala of Amida’s paradise on earth because of the uncertainty with the rise of the Bushi, and the turmoil of continuous famine and epidemic with the belief of Dharma ending age [4] [5] [6].

Horai-style garden (Heian period~) succeeded the concept from Daoism in China, known as Isle of the Immortals, the favorite subject of painting for Chinese. (Fig. 3) Horai gardens recreate the ancient belief of Horai Mountain on earth to satisfy the desire for immortality by locating the rock in the pond as its representation [7]. Notably, the Horai garden in Japanese garden was transformed with the abstract interpretation of topographical principles due to the considerable differences of the space of China and Japan, and many elements were substituted to the minimal abstract elements [2].

Shukukei Garden was developed from motifs from Yamato-e which direct translation is “Japanese painting” and its original motif comes from Japanese landscapes, literature, and expression of the Japanese sensibility in comparison. ‘Its

characteristics come from its name of shukukei (miniature landscape); minimalistic material metaphors, or mitate, (metaphoric representation); and asymmetrical, fragmented style' [8, p.196-213]. (Fig.4) It is notable to mention that certain painters from this period were also garden makers such as Kose No Kanaoka who was a court painter and master of Yamato-e [2].

The significance of the Jodo garden and the Horai garden was its spiritual elements to appease their fear of the social conditions in the era, but the Shukukei garden has served to enjoy the Japanese scenery and its spiritual adaptation will be developed by the Zen garden's appearance.



Fig.1, Oyu Stone Circle [Online].

Available: https://commons.wikimedia.org/wiki/File:Special_historic_site_Oyu_Stone_Circles https://commons.wikimedia.org/wiki/File:Special_historic_site_Oyu_Stone_Circles, n.d.



Fig. 2, Cosmological Mandala with Mount Sumeru [Online]. Available: https://en.wikipedia.org/wiki/File:Cosmological_Mandala_with_Mount_Meru.jpg



Fig. 3, Isle of Immortals, Chinese Landscapes [Online]. Available: https://commons.m.wikimedia.org/wiki/File:MET_14_76_15.jpg



Fig. 4, Yamato-E, From Genji Monogatari by Tosa Mitsukoi [Online]. Available: <https://snl.no/Tosa-skolen>

C. Reinventions and Zen

Muso Soseki (1275-1351) was a great Zen monk and considered one of the most renowned garden designers. His approach to garden making was revolutionary. Muso designed the well-known dry rock garden called Karesansui without ponds or water for the first time in Saihoji temple between 1339 and 1344 [2]. (Fig.5) His intention of Karesansui garden was to evoke the story of Chinese master monk, Liang's practice of meditation and rather simple without having patterned gravel on the ground [2]. Muso's radical approach to garden design also can be seen in Tenryuji garden where he brought an amalgam of scenery which motif was taken from Yamato-e, the landscape painting of isle of immortals, and Mount Sumeru [2].

Ryoanji garden is one of the most renowned Japanese Zen rock gardens. Small space with minimal aesthetics of rocks and the gravels rejects all the figurative shapes. (Fig.6) Although there are many arguments and theories of this abstract garden, there is a principle that governs the arrangement of the rocks in numbers. The composition of the rocks rhymes with the Daoist schema of the cosmic diagram in 7-5-3 which odds numbers are believed to be propitious in China and Japan [2]. Although there was the Daoist cosmology adaptation of Zen practice into the garden, Ryoanji is believed to be designed with elements that waved esoteric matter of the tradition since this era in the fifteenth century, the outsider laborer started to replace the monks as garden makers [2].

Daisen Karesansui Garden is equivalently famous as Ryoanji. This Karesansui garden has the story of time and 'evokes the life cycle from the stream of the river, down to the inland sea to the great sea, and reach at the infinite universe whole within the terrain of seventy square meters' [2, p.59]. In the part of the great sea, there are two conical piles of gravel, symbolic objects of Shinto to purify a space [2]. (Fig.7) Ginkakuji's conical gravel 'Kogetsudai' shares this concept of conical gravel of Shinto for the human spirit to climb up gravel mountain to see the moon [9].

The significance of all the reinvention that took place in this era relied on the concept of Zen. According to François Berthier, 'the basic principle of Zen is buddha nature to liberate the human being from the shackles of the rules and conventions imposed by society and allow one to regain the marvelous spontaneity of the child or one's primary nature, original being, or where everything emanates and everything returns' [2, p. 63]. Also, 'in Zen thought, notions of large and small do not really exist. And In Dream Dialogues, Muso Soseki wrote: Originally, there is no condition of large or small in any of the things of the universe: the large and the small are in the minds of human beings' [2, p. 2]. This

downstream concept of Zen has influenced garden designers and monks to create radical approaches to the reinventions of the gardens, such as the birth of Karesansui and its further development. Ryoanji and Daisen-in garden's radically minimalized abstract aesthetics and its smallness and even replacing monk and applied laborer for the esoteric tradition of garden design. (Fig.8)



Fig. 5, The oldest Karesansui by Muso Soseki [Online]. Available: https://commons.wikimedia.org/wiki/File:Saih%C3%B4ji_Temple_-_Japanese_rock_garden.jpg



Fig. 6, Ryoanji Temple Garden. [Online]. Available: <https://www.flickr.com/photos/numberjuan/2237728736/>



Fig. 7, Daisen-in Temple Garden's Sea and Shinto Conical Gravels. [Online]. Available: <https://commons.wikimedia.org/wiki/File:Daisen-in-1999-100.jpg>

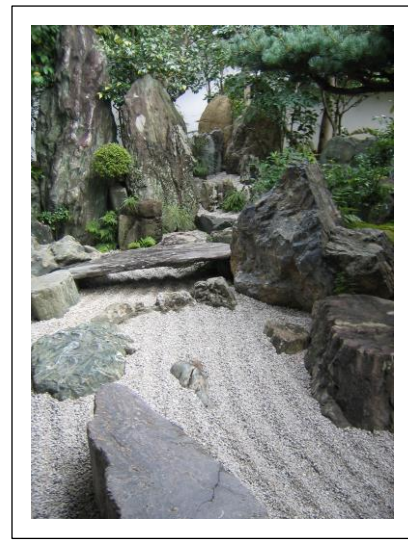


Fig. 8, Daisen-in Temple Garden's smallness and its upstream river. [Online]. Available: <https://commons.wikimedia.org/wiki/File:Daisen-in2.jpg>

D. Modern Garden

Mirei Shigemori (1896–1975) is considered a garden designer and a scholar of Japanese garden who modernized Japanese Zen garden. He has aimed to take radical approaches which most of the garden designer hasn't done for more than 2 centuries. Mirei insisted on 'Eternal Modernism, not only to succeed the tradition but also to challenge innovation which denies the imitation of the traditional garden' [10, p.345]. He applied the ancient methodology of garden making from the motif of painting but used the abstract painting from Russian master painter Wassily Kandinsky and recreate it into his garden [11]. (Fig. 9) As a result, Mirei Shigemori has invented variation of artistic innovations, such as breaking the rules of taboo with rock formation, new sand gravel wave patterns, applying non-traditional materials such as concrete and tiles into his garden [10]. (Fig.10)

Another modernization of the Japanese garden was attempted by Isamu Noguchi (1904-1988), a Japanese American artist and a sculptor based in New York. His garden-making approach was different from those of Mirei Shigemori due to his background and environment in America as a Japanese American. Isamu Noguchi's garden was not only a blend of the new and old, east and west but also a part of collaborations among the American corporate architecture landscape out of the terrain of the temple. Isamu Noguchi's approach to garden making was considered as more of his artistic self-expression and extension of sculptural space [12]. He has also challenged to create human space for the modern life where people can spend leisure time in tranquility with self-reflection, and recreation.

Although his garden concept of space for human encompasses the amalgamation of nature and the human spirit with the respect of Zen cosmology and Zen garden, Noguchi has radically eliminated the physical elements of nature in this garden [9]. Noguchi's sunken garden with Gordon Bunshaft's Beinecke Rare Book and Manuscript Library at Yale University was the symbolic modern garden

with its minimal abstract sculptures and lines of graphics of wave and ripples on the ground without a single element of nature except sky. (Fig.11) Although he has eliminated every element of nature in this garden, we can find his intention and succession of the Zen garden's composition and the use of the space from the past.



Fig. 9, Wassily Kandinsky On White [Online]. Available: https://snl.no/Vasilij_Kandinskij



Fig. 10, Mirei Shigemori Tofukuji [Online]. Available: <https://www.flickr.com/photos/17691489@N06/3205998983>



Fig. 11, Sunken garden for Beinecke Rare Book and Manuscript Library. [Online]. Available: <https://www.flickr.com/photos/shinyasuzuki/15513777433>

III. RELEVANCE

Analysis of the traditional methodology, reinvention through the Zen philosophy and modernism of the Japanese garden aimed to scrutinize to find the meaning of modernity of Japanese garden. According to David Harvey, 'History of modernism has wavered from the formation of ephemeral and fleeting and eternal and immutable. This dual formation of the conflicting meaning attributed the meaning of the modernism' and 'To be modern is to find ourselves in an

environment that promises adventure, power, joy, growth transformation of ourselves and the world and at the same time, that threatens to destroy everything we have, everything we know, everything we are' [13, p10]. With this in consideration, I can say that Zen philosophy shares the great significance of the common goals with the modernism. Also, Mirei Shigemori, and Isamu Noguchi has certainly challenged to deconstruct and threaten the taboo of the past as a modernist designer. But as David Harvey continues 'Modernity can have no respect even for its own past, let alone that of any per modern social order. The transitoriness of things makes it difficult to preserve any sense of historical continuity. If there is any meaning to history, then that meaning has to be discovered and defined from within the maelstrom of change, a maelstrom that affects the terms of discussion as well as whatever it is that is being discussed' [13, p. 11]. In this sense, the Japanese modernism of garden design, and those of modernist designer who shared my aim to create new experiences of the Japanese garden wavered from the formation of ephemeral and eternal with preserving the respect of the past anyway.

Finally, according to David Harvey, 'Modern environments and experiences cut across all boundaries of geography and ethnicity of class and nationality of religion and ideology, in this sense, modernity can be said to unite all mankind but it pours us all into a maelstrom of perpetual disintegration and renewal of struggle and contradiction of ambiguity and anguish' [13, p. 11]. Modernist, Noguchi certainly crossed geographic and cultural boundary through his work and united mankind but he emphasized the locality of the garden as a human space that has a deep connection with the land, the trees, the water, the spirit of the land, and sometimes even human affection [9]. History of the Japanese garden design also clearly indicated this inter-relation between the human spirit of the era and the locality reflected to the design of the garden which Noguchi emphasized.

In summary, although modernism of the garden design cut across the many boundaries, there is the locality which has deep connection to the human space and era. With this locality of human space for our era in consideration, I questioned if my methodology of the virtual Japanese garden or the art installation styles garden design in the gallery space can be a part of my locality and be effective method to create an asylum of present era for audiences, specifically, in the time of the pandemic and rapid urbanization with loss of tranquility.

IV. WAVE GARDEN

A. Introduction

In this paper, I am describing the artifact of my practice-based research process which focuses on art science practices as a practitioner of contemporary art. It is important for art-science practitioner to start to make art-works and artifacts or research process begins without having funded project, project space, or collaborative lab. Especially, during the time of the pandemic, when museums and galleries, lab, and any of the activity around the world have been forced to close, it is important for us to make efforts and seek an alternative way to create online activities or shift into the virtual space not

taking it as the negativity but take it as new opportunity of freedom of creation.

B. Background

Wave garden is the project which is designed to work with the hypothesis of the complex structure of Wave's perceptual and physical structure as well as intrinsic and extrinsic structures which requires facilities that can accommodate to have various complex experiments. Although there are theories of the wave with its formation and interference, the water wave's intangible materiality requires the design process to be calculated in each of the designs in order to answer the artistic and aesthetic inquiries. With this practicality and intangibility in mind, my laboratory becomes a computer in this project. The computer simulation process serves tremendous roles for knowledge-making, including aesthetic data collection by various parametric values, the decision-making process of mechanical variation, artistic scenographical visualization, and often unknown territory of the discipline of art science. These analyses of the simulation process indicated the fulfillment of the researcher's questions with regard to aesthetic expectations. The outcome of the analysis and the refined visualization will be the guide for making the next steps of the real-scale physical installation. The prior existence of such works that may or may not be included in the ongoing research process will create huge differences when it comes to engaging with real scale physical project. Wave garden also explores how computer simulation artworks can visualize and simulate the emergent experiences for both artist and audience. By emergence is meant the appearance of computer-simulated forms to the viewer not explicit for the evaluation purposes for the physical project. Here in this paper, I had described my ongoing art project's process and provided the part of the results as iteration which observed the wave's behavior through an artistic and scientific evaluation which Rainer Maria Rilke suggests 'art indebted to senses and science indebted to facts'[14, p.253].

C. Design

In the initial stage of research, I had studied theoretical literature about wave generators and related phenomena to support analysis of the proper style of mechanics and the evaluation of observational data [15]. And study guided me the various factors as well as calculable mechanic choice for my computer simulation. (Fig.12) First, the height of the water and its relation with calculable paddle movement was examined. Generally, piston paddle works well with thin water and flap paddle works well with deeper water [15]. And other related parameters such as angles, frequency, torque, and speed that can control various waves were researched. And finally, the considerations of the wave absorb system to avoid return wave reflection within the constrained water tank were analyzed. (Fig.13) In this project, I had focused on the image of the wave from the side plane which exhibits the quality of the wave crest and wavelength and exhibits the artificiality of wave normally invisible in nature. The simulation was examined by particle-based method SPH (Smoothed Particle Hydrodynamics) simulation by Realflow with Cinema 4D. And the structural transition design of river to the waterfall to the sky (Reflection of light over the ceiling) was my interpretation of the Aforementioned Daisen-in's transformation of narrow stream of river to the vast sea of the universe which evoke the unfolding of life. 'The impetuous flood flows through a gorge and passes, broadens by eating into the rocky walls, then the torrent has become a river with

a slow and majestic flow; it spreads out into a vast plain of the great river empties into an infinite ocean.' [2, p. 59]. The reason I added the waterfall and sound installation by Suikinkutsu was intended to generate the sound of water drops which emanates beyond physical space and create meditational scenery as Gunnar Cerwén says 'Studies have shown that spending time in a Japanese garden can lead to a reduction in heart rate and an improved mood' [16] [17, p.1]. The reason, I had added the concept lighting design which will follow the height of the wave by the distance sensor is to create the water wave reflection of light, projected on the ceiling of the space. (Fig. 14) This reflected wave of light aims to represent the imaginative universe in the sky in reference to the infinite ocean of the Daisen-in garden or Gingakuji's Gekkodai. In order to achieve scientific knowledge and to answer my research questions, I had created a polarizing curved wave tank which examines the Wave's 'Boundary Behavior' how the generated wave encounters reductions through the propagation process in a curved surface and meanwhile generate the scenographical flow of water wave, inspired by Daisen-in temple garden. In this process, I had applied a Piston paddle wave generator system due to the low water amplitude and ideal single wave frequency motion. During the process of finalizing the appropriate tank design, I had collected observation data of wave propagation in simulation with various radius sizes of the anti-symmetric curved flume and the different parameters of piston paddles speed. Experiments had started from the combination of 500mm radius quarter sphere and increased higher number of the radius value. Wave has diminished with lower radius flumes. And the final design was applied combinations of two uneven radius values of 2000mm radius and 1500mm radius which displayed the dynamic amplitude of the wave crest from the beginning to the halfway of the tank and serene wave flow reach to the end of the tank over a waterfall without diminishing. (Fig.15, 16) As a result, desired aesthetic wave and waterfall effect could generate tranquil and meditative qualities. (Fig.17) Finally, the mechanism of the piston paddle is considered to use a combination of step motor and Whitworth mechanism. Returning speed can be slower than forwarding movement in the Whitworth mechanism which may avoid overflow of water to the allocated electronic system. (Fig.18) Also, avoiding the excessive space of displaying the mechanism with the horizontal movement is beneficial for the viewer to be able to focus on the proposed aesthetic of the work, instead of making the audience feel the sense of reality. Question scientist may ask in this experiment would be the mathematic equation of 'Boundary Behavior' of wave propagation in the various curved tank radius, but for the artist, questions are more metaphysical and spiritual quality if wave aesthetic and spatial experience could serve as the stimulant for meditation or mindfulness for the audiences. Common ground for artists and scientists is the mind of pursuit and inquiries to the structure of aesthetic of wave formation which is ruled by the logic.

2nd part of the project focused further on the spatial and sculptural elements with wave structure interactions although the design and simulation are under the process of development. This part of the project aims to create knowledge of the wave interferences and visualizations of wave patterns within the constrained spatial setting with the concept of the Japanese Zen Garden. Karesansui garden's wave and ripple patterns were invented through the course of history as well as Mirei Shigemori's radical approach of

adapting abstract paintings. With this in mind, the researcher asks the inquiries in the project, if the application of scientific wave theory is adaptable as the garden's wave and ripple pattern for Japanese Zen garden that can represent Zen garden's cosmological theme. My question was what connects art and science in this project? Yvonne Weber says 'I myself am deeply interested in the issue of the tension between art and science' [14, p. 25]. In this Wave garden project, the result of approaching reality should include both artistic quality of the beauty of the wave as well as the aesthetic quality of beauty in reflection to the scientific wave theory. This common ground of beauty from a different perspective is the tension of art and science which ruled by the logic in this project. In this project, the process of the experiments moved forward from 2d computer simulation, physical miniature size tank experiments then the process of 3d simulation. (Fig.19, 20, 21)


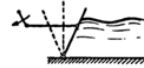


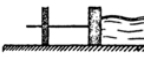
Type of Wave Generator		Diagram of Principle	Amplitude
Flexible flap			
Rigid flap with single articulation	Articulation at channel bed		Calculable
	Articulation above channel bed		
	Articulation above free surface		Not calculable by Bessel's theory
Piston			Calculable

Fig. 12, Synoptic table of various wave generator Chappell, Eric Reginald. "Theory and Design of a Wave Generator for a Short Flume." *The University of British Columbia*, April 1969. pp 22

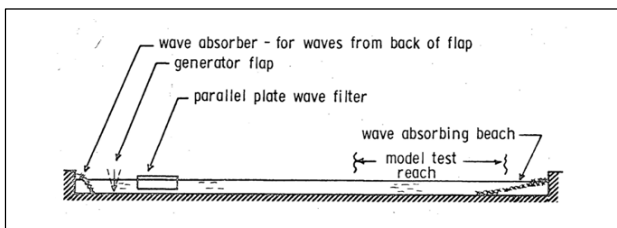


Fig. 13, Wave absorber system. Chappell, Eric Reginald. "Theory and Design of a Wave Generator for a Short Flume." *The University of British Columbia*, April 1969. pp 29

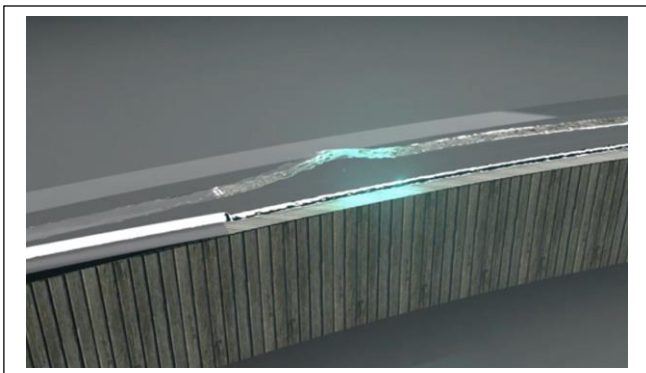


Fig. 14, Wave Garden/Concept lighting design- Interactive light follows wave amplitude.

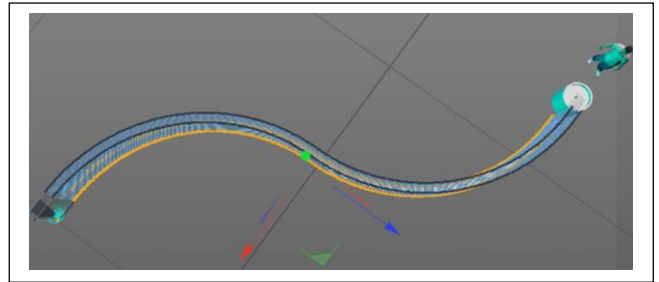


Fig. 15, Wave Garden, Wave Simulation-500mm radius tank analysis of wave decay, rapid decay at the half of the tank.

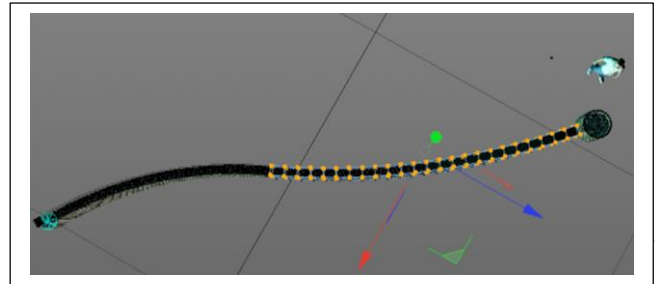


Fig. 16, Wave Garden Wave Simulation-2000mm+1500mm radius tank analysis of wave decay, successful result of clean wave reaching to the end.



Fig. 17, Wave Garden Final Design with Suikinkutsu sound installation.

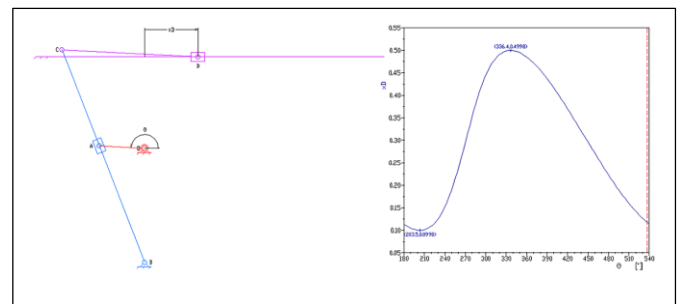


Fig. 18, Whitworth quick return mechanism- Quick+Slow return. [Online]. Available: https://commons.wikimedia.org/wiki/File:Quick_return_mechanism.gif

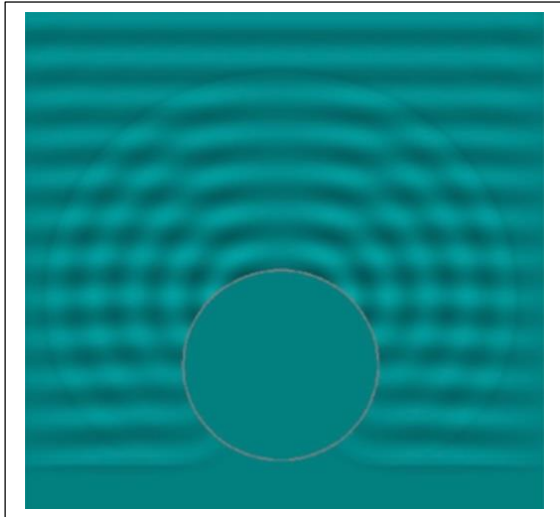


Fig. 19, 2D Wave reflection simulation with ellipse [Online]. Available: <http://falstad.com/ripp1>



Fig. 20, Miniature Wave Tank, Wave Interference Experiment.

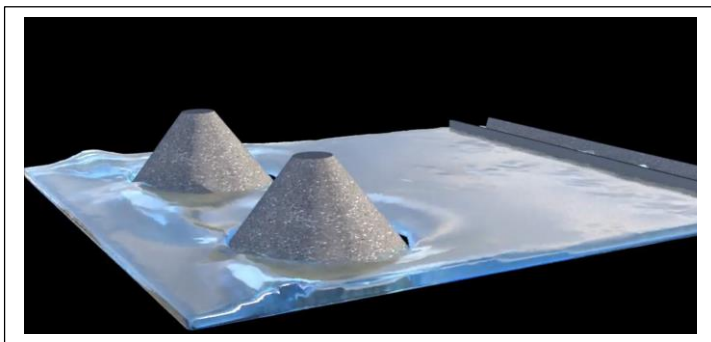


Fig. 21, Wave Garden ii - 3D Simulation analysis for Wave reflection interference with 3D Conical sculpture.

IV. CONCLUSION

How can we create the new form of Japanese garden through the idea of co-existence of nature and artificiality where space is built for humans, where humans can touch the spirituality of self and beyond, and where we can meditate and practice Zen thought in our modern life? The concept of the Japanese garden consists of its contradictory relation between the traditional and progressive culture of Japanese-ness and the researcher is convinced that there is more space for creators and garden designers to interpret and update with new forms of the Zen garden. At last, the researcher's Wave Garden is still in the prototype stage, the project has perorated the questions and will traverse into the full form in the near future.

ACKNOWLEDGMENT

This paper and the research behind it would not have been possible without the exceptional support of my supervisor, Associate Professor Mr. Nigel Powers, head of the MFA Visual communication. His enthusiasm, knowledge, and exacting attention to detail have been an inspiration and kept my work on track from my first encounter with initial wave research to the final draft of this paper. I am also grateful for the insightful comments offered by Dr. Chanyaporn Chuntamara at King Mongkut's University and Dr. Brian Curtain at Chulalongkorn University. I am also grateful to Mr. Sura Charoensuk for his generosity and expertise of all the support which saved me from many issues. At last, I am thankful for King Mongkut's Institute of Technology for providing me the amazing opportunity to research this project.

REFERENCES

- [1] Calvino, Italo, and William Weaver. "Reading Wave." Essay. In Mr. Palomar. San Diego: Harcourt Brace Jovanovich, 1985, pp.3-8
- [2] Berthier François, and Graham Parkes. Reading Zen in the Rocks: the Japanese Dry Landscape Garden. Chicago, IL: University of Chicago Press, 2005, pp.2-66
- [3] Tanaka, Yuri, and Hajime Shimoyama. "Uncertain Garden – Space Design for Fertilizing Uncertainty at IdeaSquare, CERN." *Acta Astronautica* 172 (2020): 1–6. <https://doi.org/10.1016/j.actaastro.2020.03.032>. pp. 2
- [4] Degenerate Age (Chinese; pinyin: Mò Fǎ; mòfǎ; Jp: mappō), which is to last for 10,000 years during which the Dharma declines
- [5] Bushi (, mononofu, samurai) existed from the 10th century to the 19th century
- [6] Tanba, Kenzo . "Classification of Japanese Gardens from the Viewpoint of Garden Form. *Zouen Zasshi* 7, no. 3 (n.d.). pp133 (In Japanese)
- [7] Tanaka, Tamotsu. "The Early Style of Chinese Gardens and Ancient Japanese Gardens, n.d., pp 62. (In Japanese)
- [8] KANZAKI, MAI, and JENNIFER WISE. 2013. "The Japanese-Garden Aesthetics of Robert Lepage: Shukukei, Mitate, and Fusuma-e in Seven Streams of the River Ota and Other Works." *Theatre Research International* 38 (3). Cambridge University Press: 196–213
- [9] Kawai, M. (n.d.). Environmental Sculpture: Isamu Noguchi's Garden Sculptures and Site Specificity, 77-92. pp 79-81 Kawai, M. (n.d.). (In Japanese)
- [10] Takeshi Hashiuchi. (2008). Mirei Shigemori - Rebel in the Garden : Modern Japanese Landscape Architecture. *Momoyama Gakuin University Journal of Economics and Management* 50(1.2), 343–352. pp345 (In Japanese)
- [11] Tschumi, Christian. "Mirei Shigemori: Modernizing the Japanese Garden," 2007. <https://www.amazon.com/Mirei-Shigemori-Modernizing-Japanese-Garden/dp/1880656949>. pp 23-141
- [12] Winther, Bert. "ISAMU NOGUCHI: THE MODERNIZATION OF JAPANESE GARDEN DESIGN." *Nippon Teien Gakkaishi* 1993, no. 1 (1993): 30–44. <https://doi.org/10.5982/jgarden.1993.30>. pp 40
- [13] Harvey, David. *The Condition of Postmodernity: an Enquiry into the Origins of Cultural Change*. Cambridge (Mass.): Blackwell, 2015. pp10-11
- [14] Hediger, Irene, Jill Scott, and Yvonne Weber. "Modeling Recomposing Snow." Essay. In *Recomposing Art and Science: Artists-in-Labs*. Berlin: De Gruyter, 2016. P253
- [15] Chappell, Eric Reginald. "Theory and Design of a Wave Generator for a Short Flume." *The University of British Columbia*, April 1969. P22-29
- [16] A suikinkutsu (literally "water piano cave" in original Chinese or "water koto cave in Japanese) is a type of Japanese garden ornament and music device.
- [17] Cerwén, Gunnar. "Listening to Japanese Gardens II: Expanding the Soundscape Action Design Tool." *Journal of Urban Design* 25, no. 5 (2020): 607–28. <https://doi.org/10.1080/13574809.2020.1782183.p1>
- [18] Hediger, Irene, Jill Scott, and Yvonne Weber. "Recomposing Art and Science: Artists-in-Labs/Approaching Snow from an Aesthetic and a Pragmatic Perspective, Recomposing Snow." Essay. In *Recomposing Art and Science: Artists-in-Labs*, 251–66. Berlin: De Gruyter, 2016. pp253-259