

THE REFLECTION OF LIGHT AND WATER IN URBANBANGKOK: A LIGHT INSTALLATION

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ABSTRACT

Public awareness and engagement on environmental problems are essential to instigating a positive change. This paper reports the development of a kinetic light-art installation that aims to communicate the scientific data of water quality to raise public awareness in Bangkok. It selected two key water quality indicators - dissolved oxygen (DO) and turbidity. Based on the psychology of color and human preference toward an object with curved contours, the curvature effect, the sculpture employed aquatic algae form and three light colors (blue, yellow, and red). Water Quality Index (WQI) standard provided five reference levels ranging from 0-100. Generative design software, Touch Designer, and Madmapper was used to create and to display the video file on the sculpture's low-power RGB LED light. It would also open or close according to the level of DO. The light sculpture was installed next to the pier for two nights during a local art festival and its effectiveness was assessed using a questionnaire survey. Forty-five residents and visitors participated in the survey, and nine of them gave their opinion on whether the light art installation would be useful for the community. The results suggested that some seventy-eight percent estimated the WQI correctly, and most interviewees agreed that a light-art installation would be useful and a beautiful reminder of the water pollution problem. Despite the installation's limited time, this study's light color, patterns, and movements effectively and creatively convey the water quality to the public in this context.

1. Background

Artists and scientists often need to invent new concepts and technologies to accomplish their goals? For me as a stage lighting designer, good quality of work does not just turn the lights on and off following the beat. We must learn the melody or emotion of the song. Whether it is the lyrics and the harmony between all instruments in that song and communicate through the light. Songs that are related to sadness, anger, joy, or love do not just use the instrument to represent the transmission. Light is another instrument that tries to communicate between the song and the audience. If we change the rhythm or feeling of a song? What do we do to convey that song to the audience?

This research is to create a perception of natural pollution that we could not notice through the lighting installation. In the past, rivers and canals had strong ties with people in Bangkok, whether socially or economically. Bangkok has been called by Western countries "the Venice of the East" because of the many rivers that flow through the city. Those rivers are bonded with people in many dimensions, especially for consumption and agriculture. Urban development in the past, Whether the culture and art of the community, are all derived from the river. Nowadays, the city has developed and prospered, thus transforming old society into capitalism. Society is not aware of the influence on the beautiful environment where we live. Light, as public art, could reflect the state of the environment, and this work recognizes that light can raise people's awareness of the environmental issue and can be used to inform the state of the Chao Phraya River.

2. STATEMENT OF PROBLEM

Based on the Pollution Control Department Survey, it is noted that the current quality of the Chao Phraya River has not been seriously controlled about the amount of waste that will be drained into the Chao Phraya River. As a result, the water quality in the river has deteriorated, especially in the Lower River Basin or Samut Prakan and Bangkok, by the growth rate of the population, the industrial and agricultural integration. **71%** of the pollution sources in the Chao Phraya River are from the community, **18%** from industrial pollution, 8% from aquaculture, and 3% from Swine Farm, resulting in total wastewater of 4.8 million cubic meters per day.

We all want to see the river and the canal next to our house as beautiful as the natural stream, being alive with aquatic animals and plants. By the way, we have no idea when that wish will come true. The information at the water measurement point is specific data that is too difficult and beyond the imagination of normal people who is not the specialist to perceive. Their canals are like the hell of a fish in their beautiful dreams that's why it's time we should do something with this issue. This research aims to convey the state of water in the canal through

the media that easy to perceive like the song of the river in the central theater, when the chorus came out, everyone understood the meaning of the lyrics.

3. Target Group

This research wants to convey the beauty of light that reflects the water quality in Klongsarn to visitors, artists, and locals. This research can create new interesting options for many designers such as lighting designers, architects, interactive designers, and animators who need new techniques in design.

4. Objective

1. To create an awareness of the water pollution in the Chao Phraya River for urban society by the urban installation
2. To create a light movement that corresponds to the water quality in the canal.
3. Bring the technique of Visual Lighting and adapt to Urban Installation

5. scope of study

The scope of this experiment is to study the water quality changing of Klongsan canal

This experiment brought the water quality index(WQI) of canal water in “รักษาร่มแม่น้ำเจ้าพระยา ร่วมกันพัฒนาและจัดการน้ำอย่างยั่งยืน” to create a pattern of light movement for urban installation by using data from 4 measurement points including WatPhleng canal, Somdet Chao Phraya canal, Wat Suan canal, and KlongSan canal to create a state of light due to water condition to reflect the water quality in the canal at that moment.

To create a natural light-art installation that is close to the water quality, the light pattern will be generated from WQI values. The WQI values have 6 parameters consists of PH value, DO value, BOD value, NH₃N value, and NO₃ value. But in this experiment, we use only turbidity value and DO value because these values are the main factors in improving the WQI in water.

6. METHODOLOGY

For precision and accuracy of color, pattern, and movement consistent with water quality. Therefore, it is necessary to use formulas and factors to measure the water quality that is following international standards measurement which consists of measuring various values from the sample water e.g. temperature, ph, dissolved oxygen, biochemical oxygen demand, biochemical oxygen demand in order not to make the operation and design too complicated. Therefore, this work selects only the dissolved oxygen and the dust or water clarity (Turbidity sensor). In addition to the correct comparison standard, this chapter also contains experiments and data

collection of interactive light patterns with the reaction of audiences, visual perception, and the reaction of the audience. The use of dissolved oxygen sensors for design and sending moving image signals to communicate with the luminaire.

6.1 WATER QUALITY INDEX(WQI)

water quality mean Water suitable for use in human activities. For example, the quality of drinking water must be high quality or best and the quality of water for agriculture is lower quality. The water quality of natural water sources will generally change more or less depending on the components contaminated in water and the different local environments. Due to the development of the industry. Agriculture Including population growth and amount of waste and toxic substances are increase into the environment. Therefore, before using water, the water should be check the quality first. Which requires the analysis of water quality, physical, chemical and biological to be a quality management plan. The index of water quality data include temperature, PH, DO, BOD, NH₃p.

6.2 Temperature

The temperature of the water varies with the temperature of the air. Depending on the season Altitude and terrain. Water temperature affects the environment, such as the dissolution of oxygen in the water and the survival of aquatic animals and plants.

6.3 PH

The positive potential of the hydrogen ions is the value that indicates the water is acidic or alkaline. PH measurement of water is a measure of the concentration of hydroxide ion (H⁺) present in water. At that time PH levels are between 0 and 14. PH 7 is neutral, non-acidic, and alkaline. If the pH is lower than 7, the water is acidic. If pH is higher than 7, the water is alkaline. For pH values for aquatic plants and animals, values ranged between 6.5 to 8.5 and the water quality used for irrigation is between 6.5 to 8.5.

6.4 DO (DISSOLVED OXYGEN)

Dissolved Oxygen is the amount of dissolved oxygen in water is in milligrams per liter. Oxygen is very important for the survival of animals and plants. Because oxygen is used in various processes. The process that requires oxygen is called the aerobic process. The oxygen dissolved in water under 1 atmosphere at 00C can dissolve 14.6 mg / l and 350C dissolve 7 mg/liter. The solubility decreases as the temperature increases. For instance, the summer in Thailand is going to spoil the water because in the summer DO in water is decreased because of high temperature.

In general, organic matter will assimilate and accumulated in the stream. Microorganisms use oxygen to decompose the waste in the water. If the DO value is reduced,

the microorganisms are die and cannot digest. At higher DO values, the microorganisms can degrade waste more efficiently. Besides, DO values are important in indicating that oxygen in the water source is enough for the need of living creatures.

6.5 BOD (Biochemical Oxygen Demand)

BOD is the amount of oxygen required by microorganisms in the digestion of organic matter that is degraded under oxygen conditions. The water quality index is used to determine the amount of water pollution.

6.6 NITROGEN AND NITROGEN COMPOUNDS

Inorganic nitrogen compounds, such as NH₃, NO₂, NO₃, may be present in the form of fertilizers or salts in the urine. Other types are organic nitrogen compounds, such as proteins, amino acids, nucleic acids. These substances are the body parts of plants and animals in the stool in manure.

6.7 WATER QUALITY STANDARDS

Water quality standards are the standard set up to guide the maintenance of water quality in well-maintained water resources. The determination of surface water resources by taking advantage of 5 categories.

The first category is a natural water source without wastewater from all activities and can be used for consumption.

- (1) consumption and consumption must be disinfected before the normal.
- (2) natural propagation of basic organisms
- (3) conservation of aquatic ecosystems

The second category is the source of water that has been discharged from certain activities and can be useful for

- (1) utilize and consumption by normal disinfection and general improvement of water quality.
- (2) aquaculture conservation
- (3) fishing
- (4) swimming and water sports.

The third category is water sources that get wastewater from certain activities and can be consumed.

- (1) consumption by normal disinfection and general improvement of water quality.
- (2) agriculture

The fourth category is water sources that get wastewater from

| ดัชนีคุณภาพน้ำ ¹ | หน่วย | ค่าทางสถิติ | เกณฑ์กำหนดสูงสุด ² ตามการแบ่งประเภทคุณภาพน้ำตามการใช้ประโยชน์ | | | | | วิธีการตรวจสอบ |
|------------------------------------------------------------|-----------------------|-------------|--------------------------------------------------------------------------|------------------|----------|----------|----------|--------------------------------------------------------------|
| | | | ประเภท 1 | ประเภท 2 | ประเภท 3 | ประเภท 4 | ประเภท 5 | |
| 1.สี กลิ่นและรส (Colour, Odour and Taste) | - | - | ๘ | ๘* | ๘* | ๘* | - | - |
| 2.อุณหภูมิ (Temperature) | *๒ | - | ๘ | ๘* | ๘* | ๘* | - | เครื่องวัดอุณหภูมิ (Thermometer) |
| 3.ความเป็นกรดและด่าง (pH) | - | - | ๘ | 5-9 | 5-9 | 5-9 | - | เครื่องวัดความเป็นกรดและด่างของน้ำ (pH meter) |
| 4.ออกซิเจนละลาย (DO) ³ | มก./ล. | P20 | ๘ | 6.0 | 4.0 | 2.0 | - | Azide Modification |
| 5.บีโอดี (BOD) | มก./ล. | P80 | ๘ | 1.5 | 2.0 | 4.0 | - | Azide Modification ที่อุณหภูมิ 20 °C เป็นเวลา 5 วันติดต่อกัน |
| 6.แบคทีเรียกลุ่มโคลิฟอร์มทั้งหมด (Total Coliform Bacteria) | เอ็ม.พี.เอ็ม./100 มล. | P80 | ๘ | 5,000 | 20,000 | - | - | Multiple Tube Fermentation Technique |
| 7.แบคทีเรียกลุ่มฟีคัลโคลิฟอร์ม (Fecal Coliform Bacteria) | เอ็ม.พี.เอ็ม./100 มล. | P80 | ๘ | 1,000 | 4,000 | - | - | Multiple Tube Fermentation Technique |
| 8.ไนเตรด (NO ₃) ในหน่วยไนโตรเจน | มก./ล. | - | ๘ | 5.0 | - | - | - | Cadmium Reduction |
| 9.แอมโมเนีย (NH ₃) ในหน่วยไนโตรเจน | มก./ล. | - | ๘ | 0.5 | - | - | - | Distillation Nesslerization |
| 10.ฟีนอล (Phenols) | มก./ล. | - | ๘ | 0.005 | - | - | - | Distillation, 4-Amino antipyrine |
| 11.ซิงค์ (Zn) | มก./ล. | - | ๘ | 0.1 | - | - | - | Atomic Absorption -Direct Aspiration |
| 12.นิกเกิล (Ni) | มก./ล. | - | ๘ | 0.1 | - | - | - | Atomic Absorption -Direct Aspiration |
| 13.แมงกานีส (Mn) | มก./ล. | - | ๘ | 1.0 | - | - | - | Atomic Absorption -Direct Aspiration |
| 14.สังกะสี (Zn) | มก./ล. | - | ๘ | 1.0 | - | - | - | Atomic Absorption -Direct Aspiration |
| 15.แคดเมียม (Cd) | มก./ล. | - | ๘ | 0.005* 0.05** | - | - | - | Atomic Absorption -Direct Aspiration |
| 16.โครเมียมเฮกซ์วาเลนต์ (Cr Hexavalent) | มก./ล. | - | ๘ | 0.05 | - | - | - | Atomic Absorption -Direct Aspiration |
| 17.ตะกั่ว (Pb) | มก./ล. | - | ๘ | 0.05 | - | - | - | Atomic Absorption -Direct Aspiration |
| 18.ปรอททั้งหมด (Total Hg) | มก./ล. | - | ๘ | 0.002 | - | - | - | Atomic Absorption-Cold Vapour Technique |
| 19.สารหนู (As) | มก./ล. | - | ๘ | 0.01 | - | - | - | Atomic Absorption -Direct Aspiration |
| 20.ไซยาไนด์ (Cyanide) | มก./ล. | - | ๘ | 0.005 | - | - | - | Pyridine-Barbituric Acid |
| 19.สารหนู (As) | มก./ล. | - | ๘ | 0.01 | - | - | - | Atomic Absorption -Direct Aspiration |

certain activities and can be consumed

- (1) consumption must be passed through the normal disinfection process and undergo a special water quality improvement process.
- (2) industry

The fifth category is water sources of wastewater from certain activities and can be useful for transportation.

6.8 INTERACTIVE LIGHT PATTERN WITH REACTION OF AUDIENCE

project: Land and Skin

Project Director: Arunwadi Leewananthawet

Lighting Design and Visual Designer: Pornpan Arayaveerasid

Production Designer: Nattaporn Thapparatt

Projection Designer: Laphonphat Doungploy, Natchanol Vatannakuljaras

Sound Designer: Lab 5 Soundworks

Date and Location: 28 June 2017 Assumption University, Thailand / 8-9 July 2017 World Stage Design Taipei, Taiwan

Collaboration

Stage Director/Script: Tanatan Tupthong

Production Design Assistant: Kittiya Thongphuban

Production Stage Manager: Kodchakorn Pattanakroo

Video & Sound Manager/Graphic Designer: Emnika Yimamphan

Script/Stage Manager: Thanapond Thanarayakool

Production Design Assistant Costume: Annika Buathianthong

Assistant Lighting Designer: Stapanik Supawong

PR & Sponsorship Relations: Noraouth Uthaninpipat

Stage Manager: Worrakarm Racharid

This project received cooperation from Assumption University's professor and Bachelor's Degree student. Land and skin is a performance based on Nak Phra Khanong Thai ancient fiction, Phra Khanong space and time in 1848. The audiences will be experiencing the moment of Nak's transmogrification during her final stage of delivery when she realizes the human-ghost frontier. Her desire, greed, wrath, and delusion have driven her to return in order to be with her husband, Mak. "Land and Skin" paradoxically Nak's life, when her land becomes no land and her body becomes skinless. The 40-minute physical performance will utilize the essence of body movement and non-human postures as well as interact with all design elements.

All the content was conveyed beautifully. But what interesting and considered as another main character of the show was the hundreds of ropes were hung on stage. During the show, hundreds of ropes had been transformed into many shapes, such as curtains, streams, trees, and the prison with the actors on stage. The point of the experiment was to study the response of the audience when they saw the movement of the light in a different form.

In this experiment, we have created a variety of images, including virtual reality and abstract moving images during the performance.

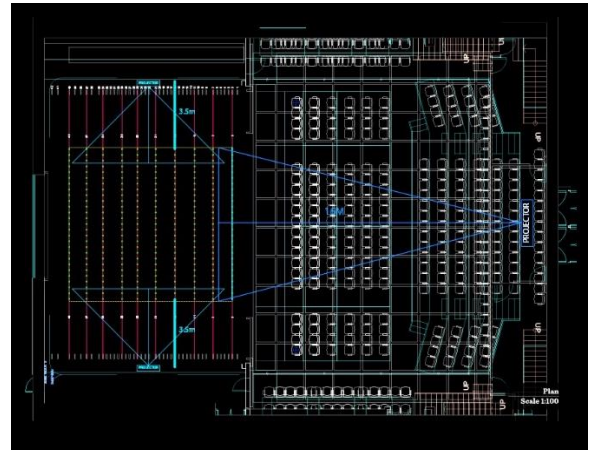


Figure 1 Top view plan of National Taiwan University Theater

This experiment uses Kinect sensor v.2 and one DLP Projector (series: PT-DW750 WXGA output 7,000 lumens) project to front ropes and another 2 projectors with 1.8 wide-angle lens project to the sideways of the stage. This system was built to capture moving objects within 3 meters from the Kinect sensor and the DLP projector that was installed 16 meters away from the first rope to create a scene.



Figure 2 side view plan of National Taiwan University Theater

The performance takes about 50-minutes-long, observing from the whole show, there is one scene out of all that was no light from the stage. There is only one abstract scene projected from the projector. That scene takes 3-minutes-long, notice that the audience can focus and concentrate more than in the virtual scene the audience can clearly identify everything. From the initial data, it is clear that images can make viewers spend more time thinking and contributing to their imagination. This makes the audience more focused on the viewer than on the spoken word or straightforwardly image.

6.9 VISUAL PERCEPTION AND REACTION OF AUDIENCE WITH THE COLOR THAT RELATE TO NATURE

Project: Interactive wall at pond live in Bangkok concert

Project Director: Laphonphat Doungploy

Visual Design: Sirasith Pooattanapong

Lighting Design: Jay Vatanakuljaras

This project aims to create an atmosphere at the walkway in front of the concert hall. An interactive wall was installed at the end of the corridor like you are walking into another dimension. We create feedback projection mapping from the virtual real-time image and project it again into the wall and design lighting movement by LED moving-head which installed above of the corridor to create a visual perception and light guide to walk.



Figure3 Interactive wall plan

This experiment is to study the response and reaction of the audience when the light is moving through the eye and which colors are the most that people like to be with. In the experiments, we used the colors blue, magenta, violet, red and green which relate to nature.



Figure 4 audience playing with

From observation, from 6 pm to 8 pm, more than 300 people attended the event and can be divided into 2 groups. The first group is the group of people who concentrate on a single color. Another group is people that Immerse themselves with all color movement over 1 or 2 minutes.

Observation data

Group1: people who concentrate on single color

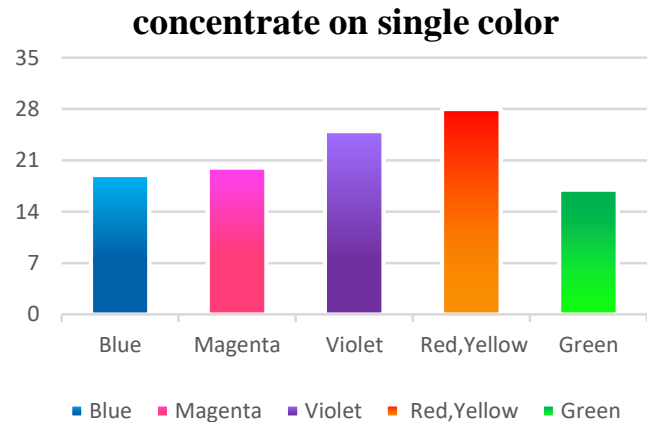


Figure 5: Observation data of people who concentrate on single color

Group2: people that Immerse they self with all color movement over 1 or 2 minutes

Comparison between different colors.

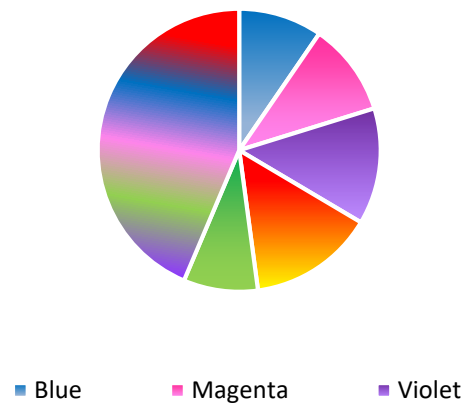


Figure 6: people that Immerse they self with all color movement over 1 or 2 minutes.

According to the survey with 300 participants, there are 210 people interested in lighting and abstract light pattern. Using colors from different time periods from natural moments and movements helps to create an attraction for the audience more than using a single color. From the observation, red and yellow tend to attract the most viewers.



Figure 7: people that Immerse they self with all color movement over 1 or 2 minutes.



Figure 9: footage of specific light scene

The only solution that can solve the problem is using non-specific scenes and play with big movements on the patterns.

6.10 DYNAMIC LIGHT PATTERN TEST WITH DMX SIGNAL ON FAÇADE ARCHITECTURE WITH LIGHTING APPLICATION

Project: Façade Lighting Design for grand opening park hyatt bangkok

Scene Design: Laphonphat Doungploy

Location: central embassy, bangkok

Collaboration: L&E, Phapoom Wiboonchai (application engineer, Osram)

This experiment aims to test video-to-light pixel mapping and LED matrix systems for projecting video light patterns on exterior lighting fixtures by DMX signal through E:CUE Lighting Application Suite.



Figure 10: non-specific scene

For 3 nights of this experiment. I expect if I have more time so that I will be able to find more conclusions.



Figure 8: raw bitmap file from E:CUE Lighting Application Suite

This experiment uses dynamic moving images into the system. But the system has many limitations. The system does not allow one light source to have more resolution than 1x1 pixels. Therefore, the problem is when I bring position data of all led façade from the software with bitmap file which is the only format that software can export and import back to the application to mapping my scene, all position data do not go together even use the raw bitmap file that software generates itself.

6.11 SATURATED DISSOLVED OXYGEN SENSOR IN WATER

Collaboration: Sorasake Kulmai, Scientist and Researcher

Location: King mongkut's University of Technology Thonburi(Bangkuntien Campus)

Specification

Dissolved Oxygen Probe

Type: Galvanic Probe

Detection Range: 0~20 mg/L

Temperature Range: 0~40 °C

Response Time: Up to 98% full response, within 90 seconds (25°C)

Pressure Range: 0~50 PSI

Electrode Service Life: 1 year (normal use)

Maintenance Period: Membrane Cap Replacement Period: 1~2 months (in muddy water); 4~5 months (in clean water)

Filling Solution Replacement Period: Once every month

Cable Length: 2 meters

Probe Connector: BNC

Signal Converter Board

Supply Voltage: 3.3~5.5V

Output Signal: 0~3.0V

Cable Connector: BNC

Signal Connector: Gravity Analog Interface (PH2.0-3P)

Dimension: 42mm * 32mm/1.65 * 1.26 inches

This test is to check the DO value that we get from our probe that can accurately measure the DO value. We have to drop the filling solution in the Filling Solution Replacement probe before measure every time. Dissolved oxygen has two types including Galvanic cell and Polarographic cell. They are electrochemical sensors that feature an anode, a cathode, an electrolyte solution, and a gas-permeable membrane. Normally we have to fill about 2/3 volume of the cap with 3 mol/L KCL solution or Potassium chloride and calculate the saturated dissolved oxygen by pump air into water for about 20 minutes to saturate the water with oxygen to obtain 100% dissolved oxygen standard liquid. In general, approximate value is around 8.15-8.25.

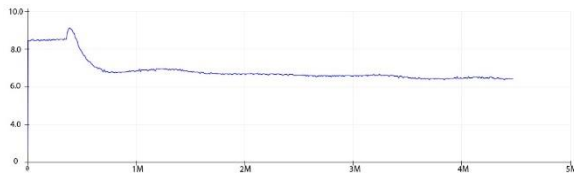


Figure 11: saturated oxygen of DO value

When testing the saturated value, if the value is the same or not very different so it is available. If the value is not the same as before, it shows the membrane has deteriorated.

After obtaining the basic value, the next step is to measure the value of the sample water by comparing the value from the saturated value. For example, where is the constant value in 4 minutes, then compare the values.

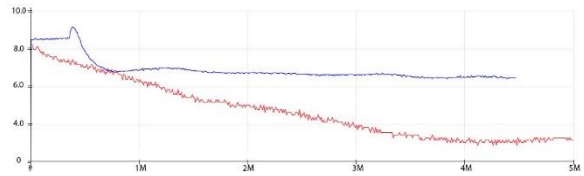


Figure 12: compare between saturated value and simple water from Tha Din Daeng

After the experiment, the saturation value was calculated. It is noted that when the water or dirt flows, the value immediately changes. If the wastewater discharge from the community or the factory as it is needed to create a joyful motion of light.

From the previous information, we are wondering why the water value from saturating value is not stable. Because the measurement of dissolved oxygen picks the oxygen in that area up to probe and another factor that makes the value unstable temperature.

6.12 GENERATE A MOVING PATTERN BY DETECT FROM DO SENSOR AND TURBIDITY SENSOR

EQUIPMENT

turbidity sensor

DO sensor

Arduino micro controller

Software

Touch designer, Madmapper

Generative design is a form-finding process that can mimic nature and environmental approaches to design, generative design can create thousands or even millions of design choices. to create a water movement, I start from noise pattern, it is the first thing that has the closest motion to the wave.

In Touch-designer, I use only 2 operators to create a wave-form, including Channel Operators and Texture Operators. Channel Operators are a powerful technology that enables the processing of motion data, audio, sensor raw data, and controls from input devices. Then send to Texture Operators that are image operators that provide real-time.

The first thing to do is to bring the raw data from the micro controller to software (Touch-designer) by serial communication. Raw data from the micro controller are a different value that software can match, for example, the sensor sends serial which contains 200-300, we have to recalculate to -1 to 1 value which can control parameter in noise such as seed of noise, period, harmonics, and amplitude of noise.

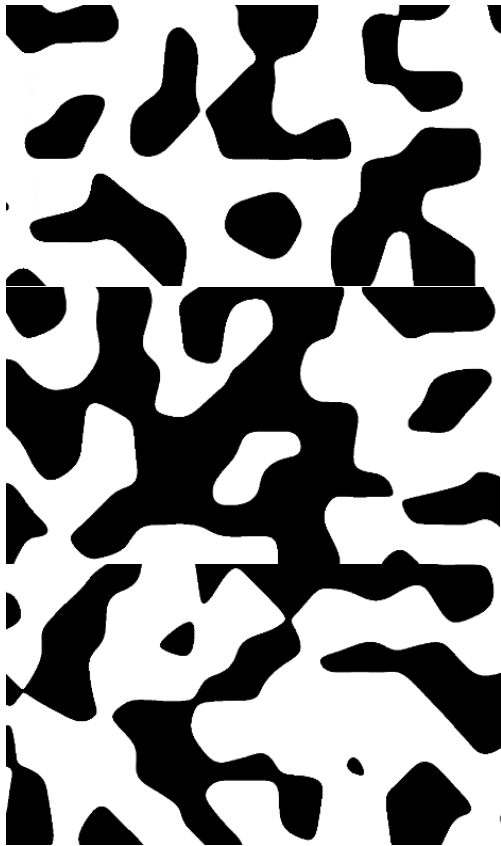


figure 13 : The Noise TOP generates a variety of noise patterns.

3.14 IDEA AND CONCEPT

Idea for design

We all want to see the river and the canal next to our house as beautiful as the natural stream, being alive with aquatic animals and plants. By the way, we have no idea when that wish will come true. The information at the water measurement point is specific data that is too difficult and beyond the imagination of normal people who is not the specialist to perceive. Their canals are like the hell of a fish in their beautiful dreams that's why it's time we should do something with this issue. This research aims to convey the state of water in the canal through the media that easy to perceive like the song of the river in the central theater, when the chorus came out, everyone understood the meaning of the lyrics

This work aims to create communication base on the nature of the Chao Phraya River. I, therefore have to design the structure to be part of nature and unharmed to life in the water. According to the researcher's information, we know that Laem Phak Bia Environmental Research and Development Project has treatments to clean up by using nature to help nature. One of the factors that make water in the river better is water plants that release oxygen through photosynthesis.

Framework



figure 13 : the node programming

3.13 Expectation from the experiment and Data collection

From all experiments and studies in this chapter, the technology is applied in almost all designs. Nowadays, technology has been adapted and developed so that general users can use it more conveniently. As designers, we have no reason not to play around with technology. From the experimental work in this chapter, it is clear that the center of all ideas is to convey the reality of nature that is invisible to be beautifully visible. Not only creating a measuring monitor various in the public but also is an artwork that focuses on creating emotions and feelings together with something as public art. This work is like transferring the music of nature and the feeling of all the heart that nature cannot speak. Finally, as a designer, I believe that this piece will be able to convey the content at the right point, and in the future, there will be many creative works that will help to raise awareness of the environment in Thailand.



figure 14 : Botanical Algae - Microscope cellular print

Water plants are very important in wastewater treatment. In principle, most of the water in the canal has small algae that we cannot see with the naked eye. When it is in the water and exposed to sunlight, it will grow to become green. After that, when exposed to sunlight, it will make photosynthesis and eventually will release more oxygen to the water. Respectively, this made me interested in the shape of the algae that could not see the structure with this naked eye and brought it into the shape and structure of the workpiece.

Concept of design

Bringing a Raw data of DO (Dissolved Oxygen) value from water quality measurement to simulated through a light-art installation.

3.15 DESIGN OF INSTALLATION AND SITE SPECIFIC

SPECIFIC



figure 15 : Mood for design

From studying and researching for structural design, I explored the characteristics of various algae and made many designs and the following picture is one of the selected designs.

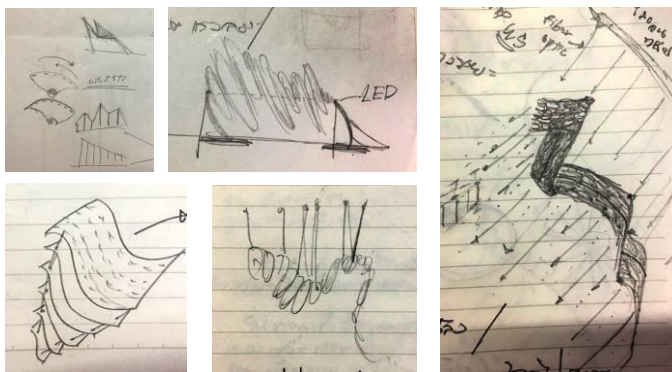


figure 16 : first idea sketch 1

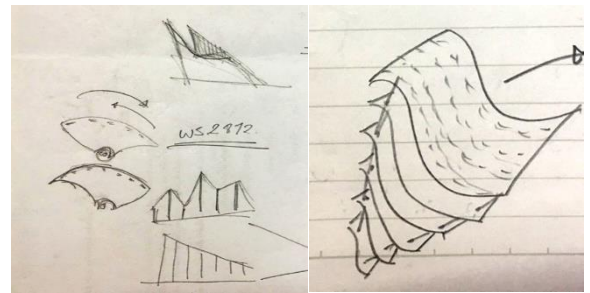


figure 17 : first idea sketch 2

idea 1: Dynamic movement structure

The first idea was to create from a line that needed to create a movement for workpieces and the possibility of using natural factors to create movement and speed.

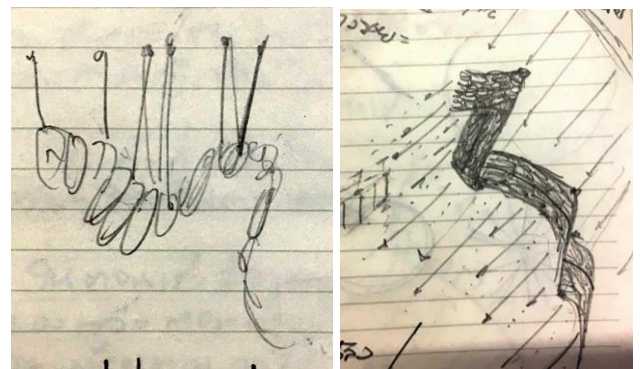


figure 18 : first idea sketch 3

Idea 2: recycle material

Developed from the first idea, we suppose to have the movement, then the surface should be such as bottles or plastic bags.

3.16 SITE SPECIFIC

Motorboat passenger density data for the year 2018

The data collection of the marine department will be sending officers to the port in order to count the number of passengers on-board the ferry in Bangkok in every route and every boat trip by counting from passengers using the port service.

Unit: People

| No. | Route | During the semester | | 2018 | |
|-----|-----------------------------------------|---------------------|------------|---------------|------------|
| | | Daily average | Percentage | Daily average | Percentage |
| 1 | ท่าเทศบาลนนทบุรี - ท่าเทศบาลบางศรีเมือง | 14,136 | 13.92 | 13,539 | 13.56 |
| 2 | ท่าเกตรา - ท่าพระประแดง | 10,136 | 9.98 | 9,793 | 9.80 |
| 3 | ท่าวิบูลย์ศรี - ท่าพระสมุทรเจดีย์ | 9,119 | 8.97 | 9,309 | 9.32 |

| | | | | | |
|---|-------------------------------------------------|-------|------|-------|------|
| 4 | ท่าราชวงศ์ - ท่า ดินแดง | 9,107 | 8.97 | 9,078 | 9.09 |
| 5 | ท่าเตียน - ท่าวัด อรุณฯ | 7,905 | 7.78 | 7,460 | 7.47 |
| 6 | ท่าสี่พระยา - ท่า รถไฟคลองสาน | 7,207 | 7.10 | 7,248 | 7.26 |
| 7 | ท่าวัดบางนาออก - ท่าวัดบางน้ำผึ้ง นอก | 6,518 | 6.42 | 6,371 | 6.38 |
| 8 | ท่าพระจันทร์ (ม. ธรรมศาสตร์) - ท่าวังหลัง | 5,852 | 5.76 | 6,068 | 6.08 |
| 9 | ท่าช้าง - ท่าวัง หลัง | 4,325 | 4.26 | 4,350 | 4.36 |

According to the above information, Din Daeng Pier is the fourth largest passenger port with 9,107 passengers per day during the opening school semester, considering the number of passengers on official days.

The period for the service users both ferry in and out with the highest density at 7 am - 8 am and 5 pm - 6 pm, Din Daeng Pier during 7 am - 8 am has 5,782 people using the pier. From 5 pm-6 pm, there are 7,923 people. Which is considered as the second largest number of crowded ferry pier across Bangkok. This is very interesting information that could be useful for the installation of artwork in the area with a large audience to get the best results for the work.



figure 19 : site specific: Din Daeng pier map



figure 20: site specific: memorial bridge NO.1

From the initial area survey, we found that the bridge at Memorial Bridge is another place that can be installed easily because it is the area inside the building. There is a power supply and can install the work without the humidity of rain.



Site-specific: memorial bridge pier

And with the building itself being a pillar and wall, it can be a good reflection of the work piece if you want to turn on the light or the light that comes out of the workpiece. Including the stories that I had to pass on to convey the quality of the water in the Chao Phraya River which was in line with the location.



figure 22: site specific: memorial bridge NO.3

The next location nearby is under the Wednesday Bridge, which is also an interesting area. Personally, from the survey at this point in the picture, there are a lot of passengers and tourists. Therefore this is the best area. After I got back from the successful completion of the idea that I can do it on time before talking to the UDDC, who organizes EAT IN SOI.

Thailand's Urban Design and Development Center (UDDC) aims to restore and develop urban areas to create a healthy space, which researches finding show that it is able to support physical activity, social interaction, and highly signify with people's healthy eating behavior. Thus the aim for a healthy space.

FINAL DESIGN

After my first meeting with the UDDC, I realized that the place that I did consider before was unable to install because it was outside the festival area. After talking for a while, I and the UDDC went to explore another possible area.



figure 23: site specific: memorial bridge NO.4

Second site-specific

Seeking an appropriate place for a while, the UDDC came up with Tha Din Daeng Pier. It is a place that I personally like because it has everything I need, a place in the shade that can protect the work from the rain as well. There are a lot of people watching the event and are really close to the water. So, I hurried back to design another new piece to fit this place.

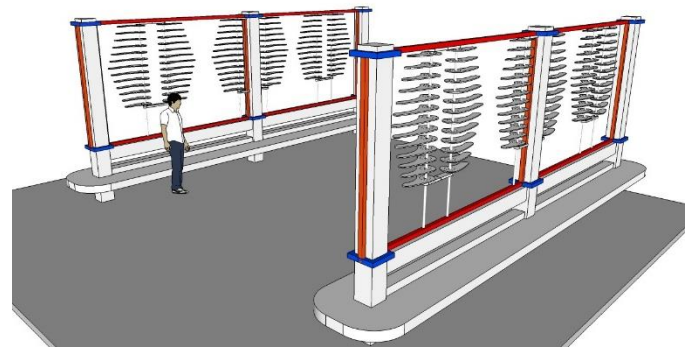


figure 23: Final design for light installation at EAT IN SOI No.1

This design is to create a kinetic light installation in the pier. The main structure of the workpiece was built to stick to the cement pillars, which is the main structure of the pier. I think it is the best choice to use the pillars of cement as the main structure of the workpiece. If the work has been rotated, the whole weight will be poured in that direction. If there is no stability in the main structure, the work may be damaged.

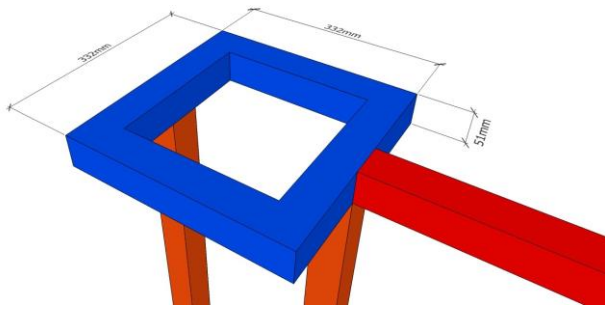


figure 24: Final design for light installation at EAT IN SOI No.2

The final design for light installation at EAT IN SOI No.2

From the final design for light installation at EAT IN SOI No.2 as a 3D model showing the main structure of the workpiece that will go to the cement pillar at Tha Din Daeng Pier. There are three knockdown systems assembled into a rectangular frame structure. When the rectangular frame was assembled, then brought various parts together.

4. EXPERIMENT AND INSTALLATION

The work consists of 4 parts: the light structure, the movement, and the control, in which everything is mixed in each section.

4.1 INSTALLATION IN URBAN SPACE AND ENGAGING WITH COMMUNITIES

This work is sponsored by the UDDC (Urban Design and Development Center), which is the organizer of the EAT IN SOI. This work had begun installing on 16 Jan 2019, which has many problems such as the original workpiece that must be placed at Tha Din Daeng pier but had to move outside the port, which was an unexpected point before.



figure 25: tadindeang market new installation area

Tha Din Daeng Market can be considered as the fastest working place because the event will be open for people to enter on the 18th. Which are we only had only 2 nights to do the installation. During the installation period, there was another social survey in this community and most people in the area cooperate very well.

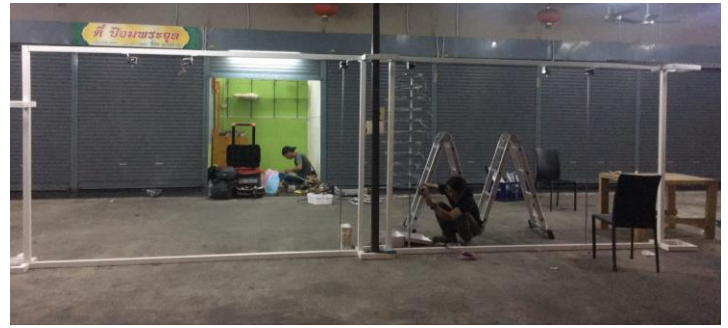


figure 26: set up the installation



figure 27: set up the installation



figure 28: set up the installation

4.2 SURVEY AND PARTICIPATION OF AUDIENCE IN URBAN AREA

After installing the work in the real place and conducting surveys and inquiring from all visitors, I had given visitors a chance to guess that the light and movement occurring on this piece of work was at which level according to the 5 levels of WQI. The 5 levels of WQI including

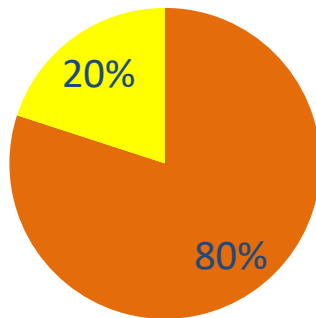
1. (WQI) 91-100 a natural water source without wastewater from all activities and can be used for consumption.
2. (WQI) 71-90 water that has been discharged from certain activities and can be used for aquaculture conservation.
3. (WQI) 61-70 Water sources that get wastewater from certain activities and can be consumed.
4. (WQI) 31-60 Water sources that get wastewater from certain activities must be passed through the normal disinfection process and undergo a special water quality improvement process before consumption.
5. (WQI) 0-30 Water sources of wastewater from certain activities and can be useful for transportation.

4.5.1 Participants

Participants consist of many groups of people, including local people in the community of paddlers who are interested in lighting design and visitors.

From the 2-day survey, the total number of questionnaires for 45 people was divided into 2 groups: 20 local people and 25 visitors.

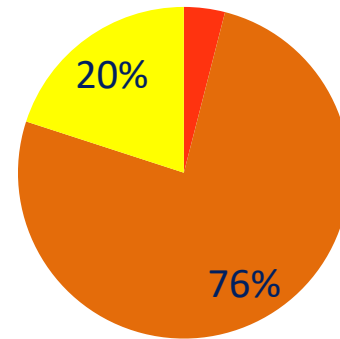
Local people(20 peoples)



■ WQI 31-60 ■ WQI 61-70

Figure29: Survey result from 20 peoples of local people

Visitors(25 peoples) 4%



■ WQI 0-30 ■ WQI 31-61 ■ WQI 61-71

figure 30: Survey result from 25 peoples of visitor

4.5.1 ANALYSIS

From the survey of the two groups, it was found that, in the beginning, the two groups were not immediately aware of what the light and the movement were from and what it was. But when the audience was informed about the artwork description, everyone can understand and can explain what happened.

Figure 29 Survey result from 20 people of local people is the first group that we explore There are both teenagers and adults aged 21-52 years. 16 people could predict correctly and 4 people predicted wrongly. The 16 people who predicted correctly took 30 seconds to think. Which is the period that can see all the light and movement clearly. For all 4 people who predicted wrongly, they predicted that the water quality is at level 3, which is close to the correct level that is at level 4.

Next is the group of tourists and visitors (figure 29). According to the picture, there were 25 visitors who did the inquiries with 19 accurately guessing and 6 were incorrect. In the number of people who predicted incorrectly, 5 guessed that the quality of water was at level 3 and 1 guessed that the quality of water was at level 5.

Social implications (if applicable)

According to the interviewing of local residents and visitors of the event, we'd found that some of the local residents and visitors agreed that this work could be benefit to the community and some did not agree.

Opinions of local residents who agreed that the art installation could be benefit to the community

- The concept and model of this art installation was interesting. It could attract people's attention and created more colorful atmosphere to the community.
- This could raise more awareness about the local river's cleanliness that was reflected by the visible moving pattern of this art installation.
- This art installation could be the new community's landmark that would affect the community positive development in the future.

Opinions of local residents who did not agreed that the art installation could be benefit to the community.

- This art installation could not be other benefit to the community except giving more light to the community.
- This art installation could not raise more awareness about the local river's cleanliness.

Opinions of visitors who agreed that the art installation could be benefit to the community.

- This art installation was full of creativity. The light movement was beautiful and it made the community more interesting.
- This art installation was modern and suitable with the community. It could be a symbol of successful community development.
- The definition and symbolic expression of this art installation was interesting.
- This art installation could be permanently installed to the community area because it could be benefit for studying and observing the water changing by light movement.

Opinions of visitors who did not agreed that the art installation could be benefit to the community.

- They believed that environment issue was less important than other issues in the community.

Summary

Most of the local residents were agreed with creating and installing this art installation because it not only drew more attention to the passer-by but also raised more awareness about the river's cleanliness that reflected the truth about community environment issue by the light movement that caused by environment changing.

In addition, local residents also believed that this art installation could be the model of creating beauty in the community that could lead to develop other community issue such as air temperature, air humidity and air pollution that also be a major problem in our country nowadays.

Originality/value

I believe that this work must be benefit to designers and people who are seeking for new things to both developing area and residential area, whether permanent or temporary installation. This art installation is a real time display of the value generating directly from the sensor that suitable for the light movement and the difference of light characteristic each time.

5.CONCLUSIONS

5.1 Conclusions

What to expect before letting people guess or know the information that will be conveyed includes

1. The attraction of people
2. Concentration until being able to watch for a long time for those who visit
3. Accurate data transfer of water quality

From initial inquiries and observations, it can be concluded that those who come to visit are focused on what they see.

From the survey, it was found that most visitors were able to predict and only some of them would wrongly guess the level of water quality at a better level than just one level which can be concluded that images that use light and movement of structures can convey water quality.

5.2 Problems of the design

About the installation, the obvious problem is the first impression. Because the appearance of this work is conveyed from specific data if visitors do not know what is the meaning of each color so they may not understand and do not recognize the artwork at first sight. If it can make the visitor understand the content of what is going to be shown without having to explain, it must be better.

Another biggest challenge is the work must still be beautiful and remain artistic while being in harmony with the environment. For example, if the indicator was from the forest so this work must not be different from the signs of weather or general environment.

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Aspects of light and color bearing on the reactions of living thing and welfare of human beings.

Color psychology and color therapy
A factual study of the influence of color on human life (Faber birren 1950)

Human Visual Perception and Eye-tracking
Eakta Jain (with slides from Jehce Lee and Carol O' Sullivan)

Jacobs and Suess (1975) investigated the effects of four primary colors (red, yellow, green, blue), projected onto a large screen.

Wexner's (1954) study dealt more generally with associations between color samples and words that describe feelings.

Max keller (2000) the art and design of stage lighting

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River glow water pollution monitor urban art installation
<https://inhabitat.com/river-glow-water-pollution-monitor-urban-art-installation/>

Motorboat passenger density data for the year 2018
https://md.go.th/stat/images/pdf_report_stat/1report_dense_cross_2558.pdf

Pollution Control Department
http://iwis.pcd.go.th/index.php?method=auto_station&etc=1517145005704

GETTING STARTED WITH PROCESSING

Casey & Ben Fry (2010)

Generative Design (2012)
Visualize, Program, and Create with processing