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INTERPOSITION OF ALIEN STRUCTURE IN AESTHETIC VALUE OF AYUTHAYA HISTORICAL AND ARCHAEOLOGICAL RUIN

การแทรกแซงของโครงสร้างแปลกปลอมต่อคุณค่าสุนทรียภาพของซากโบราณสถานในอุทยานประวัติศาสตร์พระนครศรีอยุธยา

Bundit Pradabsook[1*], Kasem Chunkao[1] and Surat Bualert[1]

[1] College of Environment, Kasetsart University,Bangkok 10900, Thailand

บัณฑิต ประดับสุข[1*] เกษม จันทร์แก้ว[1] และ สุรัตน์ บัวเลิศ[1]

[1] วิทยาลัยสิ่งแวดล้อม มหาวิทยาลัยเกษตรศาสตร์ กรุงเทพมหานครฯ 10900 ประเทศไทย

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Abstract

Aesthetic value damage evaluation on archaeological ruins was a difficult issue to address due to the public perception that it was a subjective issue. Interposition of alien structures at archaeological sites was commonly seen and caused adverse visual impacts and affected the conservation of arts and cultural heritage of the Kingdom of Thailand. There were currently no means to determine the damage of archaeological sites by interposed alien structures, thus, it was difficult to identify criteria which was needed to protect the aesthetic beauty of historical, architectural, and archaeological sites. In order to establish a method of measuring aesthetic damage to archaeological, an alien structure equation was applied: Di = SAi/SCi + [1-(lFci-Fail) + (dEi/100) + [(|Lci-Lai|)/255] + [|(Tci-Tai)|].

SAi, Fai, Lai, and Tai were size, form, contrast, and texture of alien structure; while SCi, Fci, Lci, and Tci represented size, form, contrast, and texture of archaeological and dEi was color difference. The value of Di was total damage raging 0 - 5 (dimensionless), while the rests had a value rage of 0 - 1. The application of the alien-structure equation, together with the histogram function in Adobe Photoshop 5.0 and Matlab program, showed the most effective tool to evaluate damage size of aesthetic value posed by the telecommunication tower constructed in nearby the Ayuthaya archaeological site. The study included survey, photographing, analyzing the elements of art, and experts' point of view. In conclusion, the alien-structure equation together with Adobe Photoshop computer program was effective in the determining the aesthetic damage value.

Keywords: alien structure, aesthetic value, ruins, evaluation and historical monument

* corresponding author

E-mail : Aoodbrandoo@hotmail.com

Phone : +66-8-9005-3157

บทคัดย่อ

การประเมินความเสียหายของคุณค่าสุนทรียภาพในโบราณสถานประเภทซากโบราณกระทำได้ยาก เนื่องจากการรับรู้ของสาธารณะชนว่าเป็นอัตวิสัย การแทรกแซงของโครงสร้างแปลกปลอมในพื้นที่ประวัติศาสตร์พบอยู่ทั่วไปและมีผลกระทบทางลบต่อการมองเห็น และกระทบต่อการอนุรักษ์มรดกทางศิลปะและวัฒนธรรมของประเทศไทย ปัจจุบันยังไม่มีวิธีประเมินความเสียหายของพื้นที่โบราณสถานซึ่งเกิดจากการแทรกแซงของโครงสร้างแปลกปลอม เป็นการยากที่จะแจกแจงข้อกำหนดที่จะใช้ป้องกันความสวยงามของสุนทรียภาพของพื้นที่ประวัติศาสตร์ สถาปัตยกรรม และโบราณสถาน เพื่อที่จะสร้างวิธีวัดความเสียหายทางสุนทรีภาพต่อโบราณสถานจึงประยุกต์ใช้สมการโครงสร้างแปลกปลอม โดยที่ Di = SAi/SCi + [1-(IFci-Fail) + (dEi/100) + [(|Lci-Lai|)/255] + [|(Tci-Tai)|]

โดย SAi, Fai, Lai, และTai หมายถึง ขนาด รูปทรง ความสว่าง และพื้นผิวของโครงสร้างแปลกปลอม ขณะที่ SCi, Fci, Lci และ Tci หมายถึงขนาด รูปทรง แสงสว่าง และพื้นผิวของซากโบราณสถาน และ dEi หมายถึง ความแตกต่างสี สำหรับค่า Di หมายถึงความเสียหายรวม มีค่าน้อยสุดถึงสูงสุดเท่ากับ 0-5 ส่วนที่เหลือมีค่าตั้งแต่ 0-1 จากการใช้แบบจำลองนี้สามารถคำนวณหาขนาดของความเสียหาย ซึ่งเกิดจากการก่อสร้างเสาอากาศขนาดใหญ่ของระบบโทรคมนาคมในบริเวณใกล้เคียงพื้นที่ประวัติศาสตร์จังหวัดพระนครศรีอยุธยา การศึกษาประกอบด้วยการสำรวจ การถ่ายรูป การวิเคราะห์องค์ประกอบศิลป์ และการใช้ความเห็นของผู้เชี่ยวชาญ และสามารถใช้ข้อมูลองค์ประกอบของภาพถ่ายเพื่อให้ทราบความสัมพันธ์และประยุกต์ใช้กับการคำนวณหาขนาดความเสียหายด้านสุนทรียภาพของวัดอรุณราชวราราม ในพื้นที่กรุงเทพมหานคร สรุปได้ว่าแบบจำลองโครงสร้างแปลกปลอมร่วมกับการใช้ โปรแกรมคอมพิวเตอร์ Adobe Photoshop ใช้ได้ดีในการประเมินค่าความเสียหาย

คำสำคัญ : โครงสร้างแปลกปลอม, คุณค่าสุนทรียภาพ, ซากโบราณสถาน, การประเมิน และโบราณสถาน

Introduction

Like Laos, Cambodia, Myanmar, and other Southeast Asian countries, the Kingdom of Thailand has been named a symbolically cultural country. There are a lot of historical and archeological cities that spread throughout the country and the most important aesthetic value sites are in Ayuthaya, Sukhothai, Kampangphet, and Lobburi provinces. Among these historical and archeological cities, Ayuthaya ruin has been kept for aesthetic values for young generations and tourists to learn. Consequently, an increased amount of houses, shop houses, buildings and other constructed objects has gradually replaced the old-style Ayuthaya city. This new scenery causes an urban density, resulting in less green cover, and heavy traffic similar to Bangkok. This disordered development can be seen in photographs and motion pictures. The aesthetic values of historical Ayutthaya have been negatively affected by the rapidly changing surroundings. The occurrences of deflection on the walls, columns, and another parts of the ruins by graffiti lead to the need to set up a measurement in order to maintain 230 year-old history of Ayutthaya, and keep the aesthetic beauty for tourism. The government has put forward a strong effort for reconstruction of decaying ruins, but there has been no evaluation or quantified guidelines regarding alien construction

or management of environmental aesthetics for the Ayutthaya ruins or others by the rest of the country. This research's objectives are to determine criteria and quantification method for the evaluation of aesthetic value damage.

Methodology and Materials

Description of the terms used

1. Archaeological ruins

FADMET[1-3] defined the archaeological ruin as any construction or building that used to be utilized for a specific purpose in the past, but nowadays it has been neglected as scenic resources. Moreover, it has been illuminant as content value in many aspects: living and dead monument, art environment, cultural heritage, artless beauty, environmental aesthetics, visual amenity, sensory perception and historical learning area[1-16]. In academic point of view, archaeological ruin means objective and subjective elements of arts and also environmental aesthetics with natural harmonization and surroundings of ecological systems which conprised of four functional groups: producers, consumers, decomposers, and supporters/nutrient pool[5,17,18]. In other words, when archaeological ruins are considered as historical systems, they sometimes are called cultural ecosystems, of which their four functional groups would comprise aerial ruin structure as producers, art elements as consumers, aesthetic values as decomposers, and content of values as supporters. Integrated management of such ruin ecological systems could be expected to keep those four functional groups for sustainably aesthetic sources to tourists and viewers. In turn, such management could diversify local people income which is a main factor to improve their life qualities [2,6,8,19-21]. For aesthetic value evaluation, each functional group has to be quantified in order to relate the aesthetic ruin system function as explained by Chunkao, Ipekoglu, Gasper and Bristo, and Rebano-Edwards.[5,22-24]

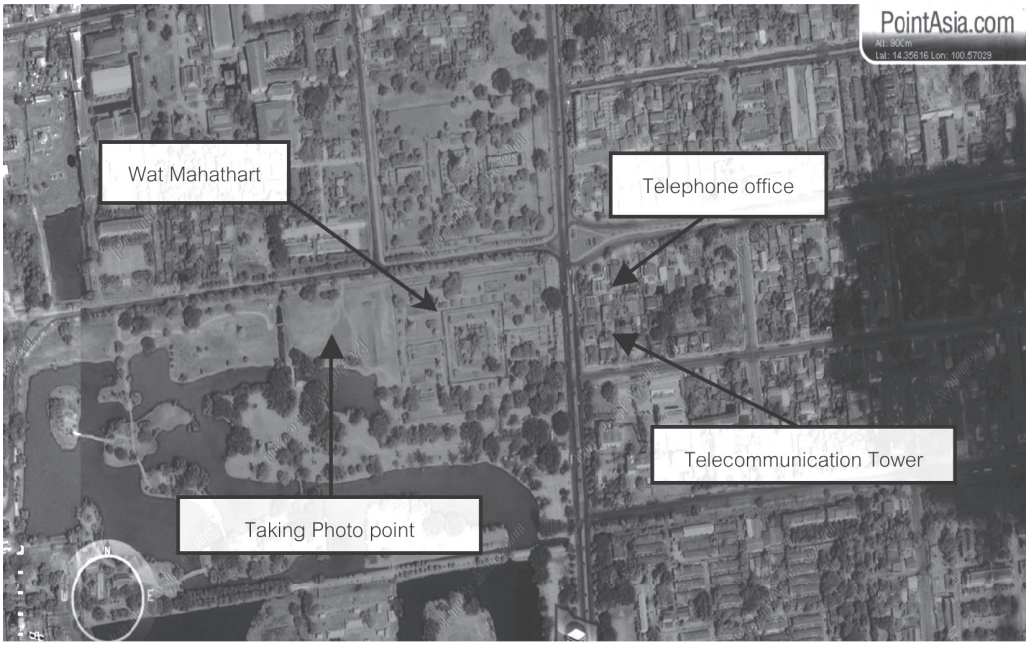
2. Alien structure

An alien structure is identified as reconstruction which would be dedicated as aesthetics of decay for visual perception in the historical ruin systems [9,12,23]. As stated by Odum and Chunkao[17,5] that the change of historical ruin systems would take place when a structure as of adverse visual impact was changed from the beginning. The change of vision could be reconstruction of electricity post, flagstaff, antenna pole, tower and high buildings [6-7,10]. In reality, the aesthetic ruins are mostly damaged by color sprayed, written with different colors and sculptured on poles, walls, statues, pagoda, floors. Some other artless beauty materials for decoration have the content

values the same as the historically archaeological values. Such stains on construction materials certainly cause aesthetic ruins more or less visual amenity that needed to be determined in order to evaluate four damaging levels: damage (in worse case), destroy, depreciation, and useless. The results of evaluation is expected to set the obligations, laws, environmental education, and technological management for the protection, and also remediation plan.

Study area

The study site was Wat Mahathrat in the city of Ayuthaya, located on Shegun Road (Figure 1). The study area was 130 X 249 m. with high potentials not only as historical ruin but also aesthetic value for tourist site, but interrupted by the telecommunication tower. It is noted that the scope of the research was only in historical ruins of Ayuthaya, the outside historical ruins were neglected.



(a) Location

(b) Lay-out

Figure 1 Location and Lay-out of Wat Mahathart

There are a lot of historical issues concerning aesthetic values in Ayutthaya, particularly ruins of abandoned palaces and temples over a long period of time. These ruins have been attractive areas for studying the history, sightseeing as well as learning about the growing of lowland in Thailand. In addition, information concerning the history, architecture, and the art of Ayuthaya ruins have an important role in the content value and empirical aesthetics. Reconstruction objects' information, i.e. high buildings, towers, high electricity poles and other large structures was collected from secondary resources.

Developing mathematical model for alien structure evaluation

Generally, scenic resources are those merged to harmony together in order to provide environmental aesthetics for stimulating visual perception of viewers. The content of value is normally composed of five elements of art: size, form, contrast, color, and texture of objective and/or subjective ruins and nature[8,25-28].Those five components can be statistically expressed as in Equation (1).

$$D.=. f(S, F, CT, C, T) \quad (1)$$

where

D = value of damage with value o = less damage, value 5 = more damage

S = value of size of coverage area as given by pixel

F = value of form in circle, o to 1, value 1 = circle, value o = opposite" circle

CT = value of contrast, value o = no contrast, value 255 = contrast

C = value of color, value o = same color, more than o = different color to 100.

T = value of texture, value o = harmonized texture, value = 128 rough texture

Constant values were added in Equation (1) to obtain multiple regressions as shown in Equation (2).

$$D = a + bS + cF + dCT + eC + fT \quad (2)$$

Where a, b, c, d, e, f. are constant values in fraction of which each value is equivalent to or less than 1, except 'a' is zero due to D value begining from zero to 5. Therefore, Equation (2) can be rewritten into Equation (3).

$$D = S + F + CT + C + T \quad (3)$$

Equation (3) indicates that the value D (damage) can be evaluated by quantifying S, F, CT, C, and T under visual amenity analysis from photographs taken at the visual field. In order to accomplish in quantifying those unknown indicators, 10 photographs were carried out, therefore Equation (3) turned into Equation (4).

$$Di = Si + Fi + CTi + Ci + Ti \quad (4)$$

where i= 1, 2, … , 10

1. Determination of aerial size evaluation

Due to size value is an area, as given by pixel numbers, which belongs to the design of the model of alien structure determination. It is necessary to take the size of area as the main component and factor for modeling design by comparison between alien area and archaeological area. The usable application has to be in normalized form of SAi/SCi, where SAi is equivalent to alien area size(value 0 to 1) and SCi (value 0 to 1) is archaeological area size of photograph number i.

2. Evaluation on alien structure form

According to the alien structure, form value is taken the circle as a main part for comparison by giving the most circle form of 1, while 0 as the opposite circle form. The different result between those two sizes (Fci - Fai) is the form In opposite to the other component value rather than circle value from 0 to 1. Therefore, the adjusted different result value is at maximum 1 obtained factor or component value as 1 - (Fci - Fai). In mathematical point of

view, (Fci - Fai) is the absolute number. This concept causes the change of 1 - (Fci - Fai) to be the normalized form of (1- l Fci - Fai l).

3. Evaluation on contrast

The basic concept is based on luminance with the minimum of zero (0) as the most luminance of no contrast to the maximum of 255 as the least luminance or contrast. The comparison of luminance structure between alien structure (La), and archaeological site (Lc) are adjusted absolute value as well as normalized form resulted in (Lci - Lai)/255. [(Lci - Lai) = 0 to 255.].

4. Evaluation on color value

The color played vital role in visual amenity which is accepted as aesthetic values of both merging natural beauty and harmonically art environment as well as living monument and historical ruins. In order to accomplish, the color value is necessary to evaluate by comparison the difference between value of alien structure (Ca) and aesthetic site (Cc). If the color difference (Ac) is equivalent to zero (0), that means the two colors are the same. Similarly, if the color difference is larger, it can be compared to the white color (L) which is equivalent to 100. The evaluation of color difference which proposed by CIE and O'Brien [29-30] are shown in Equation (5).

$$dE = [\, dC2 + dA2 + dB2 \,]1/2 \qquad (5)$$

where

dE = color difference, value 0 to 1,

dC = color difference between alien structure and archaeological site

dA = color difference between alien structure and white color

dB = color difference between archaeological site and white color

There are two cases: (1) if L is equivalent to 100 (extreme white), A and B equivalent to 0, then dE would be 100; (2) if L is equivalent to 0 (extreme black), A and B equivalent to 0, then dE will be 0. Consequently, the value dE, the dAvalue of color, in Equation (5) has to be dEi/100 for color evaluation (Ci) in Equation (4).

5. Evaluation on texture value

The texture of visual amenity is another aesthetic and historical ruins. It is determined by giving 0 (zero) representing the same texture (plain texture) in which the texture difference is equivalent to zero (0) between alien structure and archaeological site, while the extreme texture equal to 128 (rough texture). Therefore, the comparison between alien structure (Ta) and archaeological site (Tc) can be obtained as l(Tci - Tai)l. In order to complete the alien structure model, then Equation (4) is substituted by the values of those 5 elements of arts into Equation (4) to obtain

Equation (6), alien-structure equation.

$$Di = SAi/SCi + [1- I(Fci - Fai)|] + dE/100 + [(|Lci - Lai|)/255] + [(|Tci - Tai|)/128] \quad (6)$$

Adobe Photoshop computer program together with ten interposing sizes of alien structure photographs on the historical and archaeological site are essential tools to calculate Di in the Equation (6). From five element components, each of them equivalent to 0 - 1 and all equivalent to 0 (as no visual amenity) to 5. It is remarkable that transparent materials and/or tall - spear form usually give value Di less than dim - rectangular constructed materials and/or big and tall buildings, but green trees are exempted because the eyes become familiar with green color.

Field survey

Survey was carried out to identify alien structure likely to affect Ayuthaya ruins and artless beauty. In the mean time, photos were taken from the west side of Wat Mahathart (Figure 1) about 100 m distant. This area has been used for important activities and defined as landmark point.

Determining the unknown values in Equation (6) in the area to be used for calculating the damage values using photographs taken earlier.

Alien structure defines as acceptable size of alien structure that could be obtained from model calculation as compared to criteria obtained from questionnaires commented by artists and architects.

Results and Discussion

The results from the determination of alien structure affect on the aesthetic value of Ayuthaya historical and archaeological ruins which was taken as the representative of all art environment existence around the kingdom of Thailand are as follows.

Existing Wat Mahathart

Wat Mahathart (Mahathart Temple) has been in existence since 1374, about 638 years, and was damaged in 1767 by Burmese troops at the same time of Ayuthaya collapse. Since then, the temple of Wat Mahathart has become an aesthetic ruin on which the Fine Arts Department declared under the Rule number 3 concerning with “traditional display” or “remained or lost civilization”, and giving official name as historical city of Pranakhon Sri Ayuthaya in the year of 1991. Actually, the Fine Arts Department promulgated the Ayuthaya historical site as national archaeological site on 8th March 1935 in order to protect any intrusion both inside and outside around the target area.

At present, Ayuthaya historical area has been changed and improved by the Fine Arts Department to achieve the aesthetic value used for education on Thai history and for tourism. Evidently, the study site has been occupied both inside and outside with the buildings as alien structure causing decay on aesthetics, and also depreciate its aesthetic value. In other words, those alien structures have an adverse visual impact on aesthetic ruins of Ayuthaya archaeological city (Figure 2).

Figure 2 Damage characteristics of visual amenity of Wat Mahathart

Besides alien structure, there are telecommunication tower outside the aesthetic ruin destroying the environmental aesthetics. Also, some scratches, dry marks, stains, cuts, cleavages, and cracks are found on the walls, pagodas, poles, statues, and decorated materials. Unfortunately, these kind of criminals cannot be accused and fined because there is no such laws concerned.

Alien structure photographing

In order that the alien structure has been depreciated for long period of time and causing on an aesthetic values and visual amenity in terms of alien structure size, height, length, width, form, contrast, color, texture, and symbolic values, particularly Ayuthaya historical and archaeological site. After scientific observation and field survey in the target

area, ten alien structure photographs were taken to represent the 10 interposing of Wat Mahathart aesthetic ruins by applying adobe photoshop computer program as shown in Figure 3.

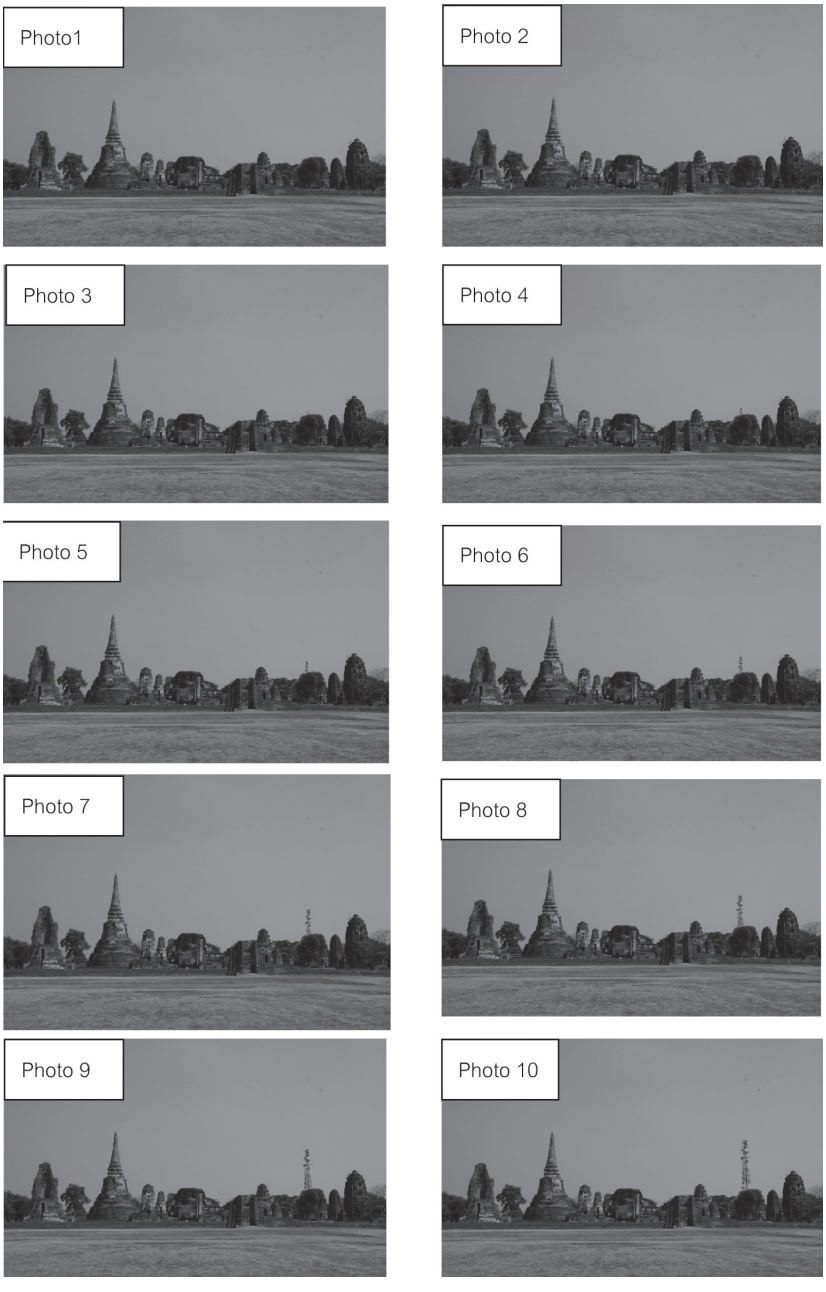


Figure 3 Gradual increases of interposing alien structure from non to full interposing alien structure

It was quite acceptable on photo1 in Figure 3 because there was no alien structure interposing the environmental aesthetics and also encouraging sensory perception to the viewers. For the consecutive photo 2, it was still showing view of cultural heritage together with fully visual amenity and historical and archaeological site of Ayuthaya aesthetic value as photo1 but site visiting can be detected while photos 3 and 4 were gradually interposed by telecommunication tower but they would be accepted the visual perception among views. The photos 5 and 6 seemed to be unsatisfied for most of the viewers, especially old generation as the same as artists and architects. In particular, photos 7, 8 and 9 could not be accepted more and as the same condition as photo10 which might be as worse in visual pollution.

In principles of environmental science, every environment has its own function which are movement, productivity, reproduction, and regeneration, depending on its structure (species diversity, quantity of each species, proportion of species age/size and among species, and distribution of each species) [5]. In other words, each environment function is depended on the status of structure, if the structure changes then the function changes. In relation to alien structure interposing in the visual view, the structure has been completely changed that caused the change of its function for visualization such visual view. Therefore, when the alien structure in visual view is gradually increased then its function is also increased and becomes visual pollution.

Damage evaluation of alien structure

Basically, the visual toxic hazard has been depended upon the degree of alien size, shape, form, color, contrast, and texture which were determined according to Equation 6 using Adobe Photoshop computer program. Table1 and Figure 4, indicated that the interposition of local telecommunication tower interrupted signalization of historical and archaeological site of Ayuthaya ruin at various levels from 0 to 1.86 marks (D values) (see also Figure 3 (photos 1 – 10)). Actually, D value can rise up to 5 marks, but telecommunication tower is somewhat transparent-rectangular-shaped construction and also small-sized interposing of the Ayuthaya aesthetic-visual field due to influenced by size, color, form and texture. In the same condition, the big buildings or tall statues are the most effective alien structure to change the aesthetic value of Ayuthaya ruin because of its form and texture rather than its color and contrast on the visual amenity.

Table 1 Values of size, form, contrast, color and texture of ten interposing photographs of TOT telephone post nearby Ayuthaya ruins

No	Characteristic	Photo number										Remarks
		1	2	3	4	5	6	7	8	9	10	
1	Size											
	1.Alien	0	ND	294	486	2066	3898	6550	10366	14964	21697	0-1
	2.Site	41905	41905	41905	41905	41905	41905	41905	41905	41905	41905	
2	Form											
	1.Alien	0	ND	0.558	0.419	0.277	0.261	0.261	0.234	0.210	0.198	0-1
	2.Site	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	
3	Contrast											
	1.Alien	0	ND	134.95	136.42	136.40	136.13	135.47	135.04	132.56	135.53	0-1
	2.Site	75.50	75.50	75.50	75.50	75.50	75.50	75.50	75.50	75.50	75.50	
4	Color											
	1.Alien											
	1) L	-	-	54.4	47.4	48.9	52.2	46.8	52.4	47.8	48.2	0-1
	2) a	0	ND	1.4	1.2	1.8	1.6	3.0	1.6	1.6	0.2	
	3) b	0	ND	0.6	-0.2	0.8	0.8	0.6	0.0	0.0	-0.6	
	2.Size											
	1) L	-	-	40.6	40.6	40.6	40.6	40.6	40.6	40.6	40.6	
	2) a	8.82	8.82	8.82	8.82	8.82	8.82	8.82	8.82	8.82	8.82	
	3) b	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	
	3. Δ E	-	-	20.4	17.23	17.32	18.77	15.65	19.46	17.07	18.30	0-1
5	Texture											
	1.Alien	0	ND	34.92	36.62	39.08	40.19	40.80	41.81	43.19	43.21	0-1
	2.Site	28.01	28.01	28.01	28.01	28.01	28.01	28.01	28.01	28.01	28.01	
6.	D value	0	ND	1.02	1.16	1.33	1.42	1.44	1.59	1.68	1.86	0-5

Remarks; ND = non-detectable, but detectable on field observation

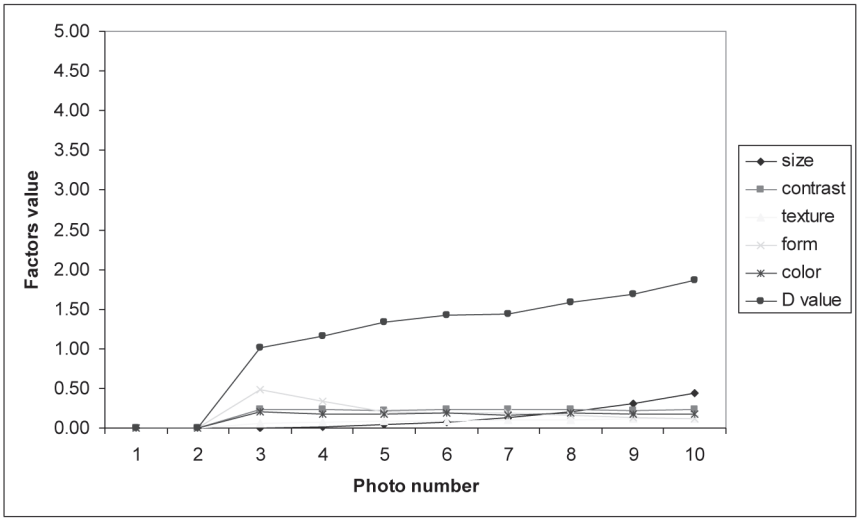


Figure 4 Evaluated values of size, form, contrast, color, and texture by computer program in order to determine the damaged values (D value) on aesthetic value of Ayuthaya ruin

Interposition criteria of alien structure

It is difficult to identify alien structure's characteristics' criteria that affect aesthetic values[1, 3, 21, 25, 28, 31] (size, form, contrast, color and texture). CIE and O'Brien[29,30] proposed the color criteria equation as the grassroots for deriving Equation (6) using Adobe Photoshop computer program to determine its damage value (D value), resulting in Figures 3 and 4 and Table1.

The color gave the various values of damage in which the criteria can be classified into four levels as shown in Figure 5: balancing (photos 1 - 3; warning (photo 4); risky (photos 5 and 6); and critical (photos 6 - 10). Chunkao[4,5] and Odum[17] explained that whenever the aesthetics value is balancing, there will be no change in structure (if it changes, it can recover in shorter time). Warning value means changing in structure but there is no change in function. Risky value means there is no change in structure but change in function. Critical value means there is changing in both structure and function. The damage or risky criteria was between photo 5 (1.33) and photo 6 (1.44) (Table 1) the average equal 1.37 was the accepted aesthetic value damage. Conclusively, the interposing of telecommunication tower (photos 6 – 10) cannot be accepted as it devalues of aesthetic of Wat Mahathart both historical and archaeological ruin.

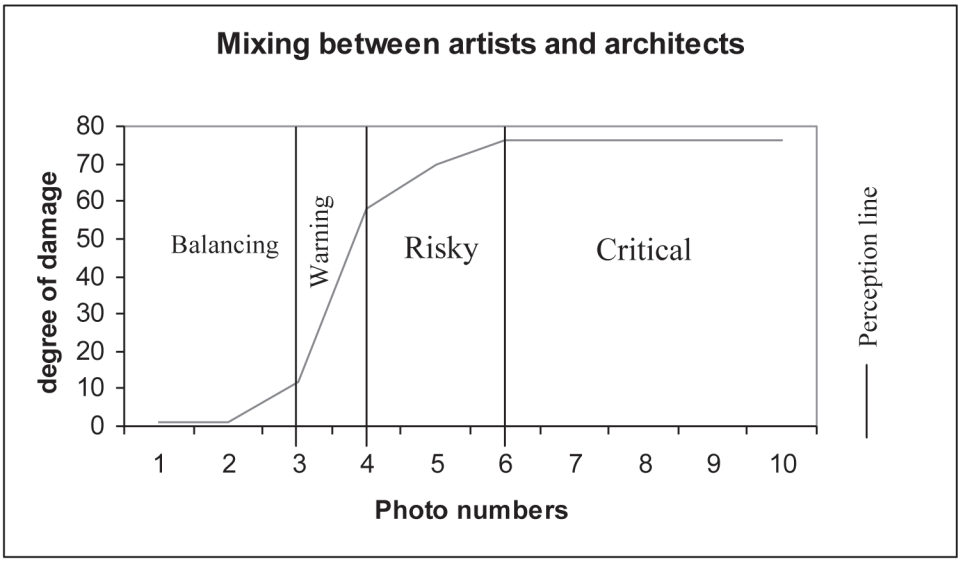


Figure 5 Criteria identification of interposing area of alien structure (antenna and TV- TOT post)

Criteria specification of well-informed persons

Damage evaluation of alien structure interposition at Wat Mahathart obtained were viewed by the experts. Therefore, 39 architects and 36 artists were selected from well- known universities, government offices, and private sectors in order to criticize those ten photographs if they are acceptable or not acceptable. The results indicate in Table 2 and Figure 6 are somewhat similar to the calculated results as shown in Figure 5. From the results of aesthetic value damage in each 5 components (Figure 4) show change of elements of art (slope) in photos 5 - 7 less than photos 3 - 4 (Figure 4). It is brought to state that the alien-structure mathematical model would be effective enough to determine the damage and the criteria of aesthetic value of historical and archaeological ruins not only Ayuthaya city but also in the whole existence of aesthetic ruins in the Kingdom of Thailand. So far, the application of this model to Temple of Dawn (Wat Arunvanaram) illustrated in Table 2 has the result with precise applicability.

Table 2 Numbers of interview for perception sensitivity interviewing about interposing alien structure as illustrated in each photograph

Interposing area in photo number	Interviewers (%)	Perception sensitivity		Total
		Perception	Non-Perception	
		Person (%)	Person (%)	Person (%)
1	75 (99)	1 (1)	0 (0)	76 (100)
2	75 (99)	1 (1)	0 (0)	76 (100)
3	64 (84)	12 (16)	0 (0)	76 (100)
4	18 (24)	57 (75)	1 (1)	76 (100)
5	6 (8)	59 (78)	11 (14)	76 (100)
6	0 (0)	42 (55)	34 (45)	76 (100)
7	0 (0)	25 (33)	51 (67)	76 (100)
8	0 (0)	7 (9)	69 (91)	76 (100)
9	0 (0)	1 (1)	75 (99)	76 (100)
10	0 (0)	0 (0)	76 (100)	76 (100)

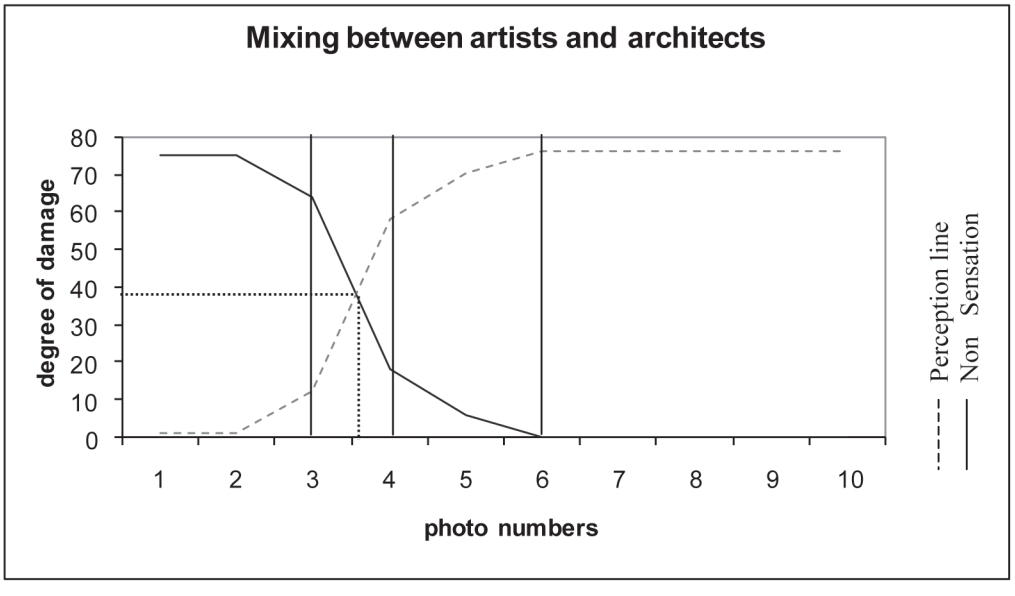


Figure 6 Relationship between degree of damage and interposing area in photo number of Wat Mahathart in Ayuthaya province.

Figure 7 Wat arunvanaram taken for testing the validity of adapting alien-structure equation

Conclusion

It was understood that there is a difficulty to evaluate the damages of historical and archaeological sites as well as the aesthetic ruins and temple walls. Whenever there is such damage, the government cannot accuse or fine them. In order to serve the needs, the alien-structure equation is developed and adopted as a tool for the evaluation of damage of the aesthetic value of historical and archaeological ruin by using 5 elements of art which are independent variables; size, form, contrast, color, and texture. Hopefully, the alien-structure equation can be used to evaluate the damage of any aesthetic value of historical and archaeological sites in Thailand.

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