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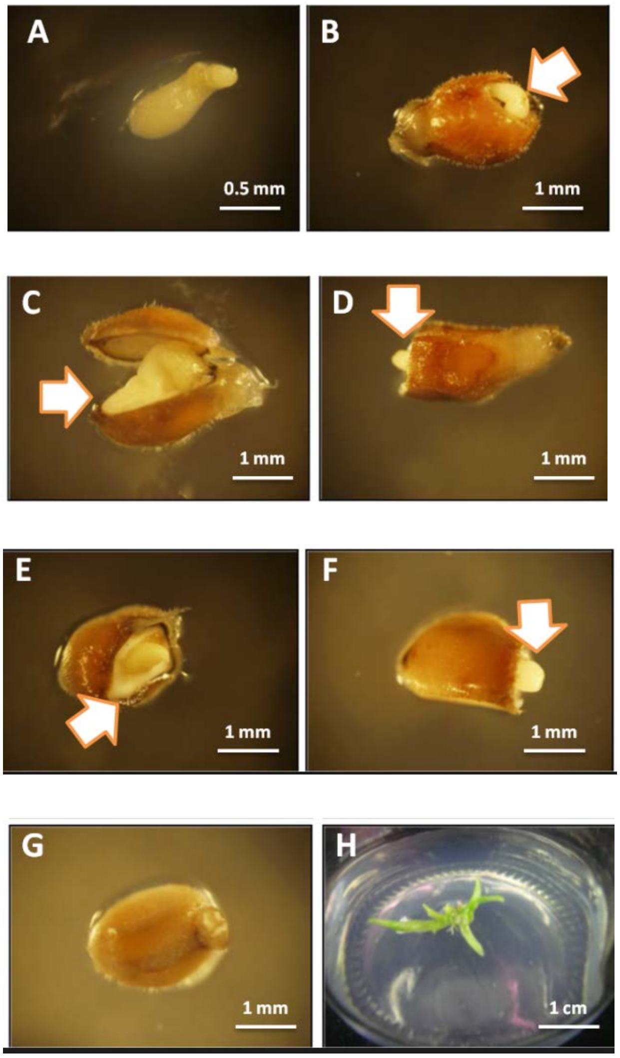

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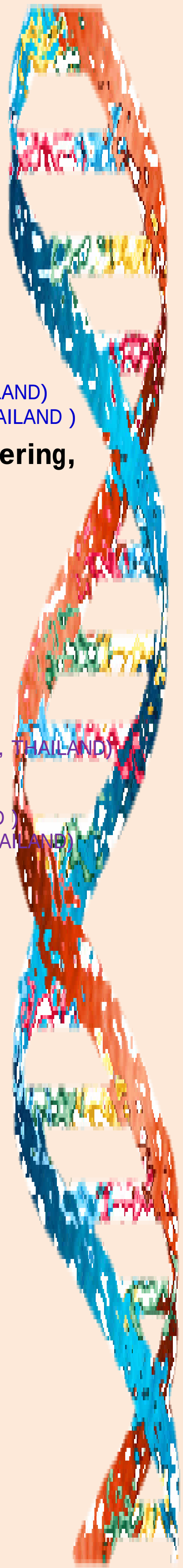

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Break Dormancy by Trimming Immature *Globba* spp.

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ABSTRACT

Young *Globba winitii* seeds at 20 days after pollination were collected and trimmed at different parts of their seed coat, then cultured on MS medium supplemented with 10 mg/l BA, 1.0 mg/l NAA, 10 mg/l GA_3 and 30 g/l sucrose. The results showed that the trimming method could break dormancy, and young embryos germinated in the first week. Seeds trimmed down to a naked embryo had the highest germination rate, germination index and speed of emergence, which were 98.03%, 22% and 100%, respectively.

1. Introduction

The genus Globba (hundred species) is one of the largest genera in the primarily tropical Zingiberaceae. Globba along with the small genera Gagnepainia, Hemiorchis, and Mantisia comprise the Globbeae, one of the two tribes of subfamily Zingiberoideae (William *et al*, 2004). Globba species are distributed throughout tropical (and parts of subtropical) Asia, ranging from India to southern China, south and east to the Philippines and New Guinea, with the center of distribution in monsoonal Southeast Asia, especially Thailand and Myanmar. Virtually all species distributed north of the Isthmus of Kra (most species of *Globba* and all species of the remaining genera) enter dormancy from approximately November through

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April, while most species south of that point remain evergreen throughout the year. The other three genera of Globbeae are more restricted in distribution and fall completely within the range of *Globba* itself. Gagnepainia is found primarily in Thailand, Laos, Vietnam, and Cambodia. (Seliger and Mc Elroy, 1995).

Flowers in the Globbeae, like all Zingiberaceae, are among the most highly derived in angiosperms (Endress, 1994; Kress *et al*., 2002). Calyces in the Globbeae are highly reduced, with petals replacing most of their protective function. Standard petal function (i.e., pollinator attraction and mechanical assistance to pollination) has been co-opted by elaborate staminodes that have replaced four of the six stamens that were fertile in ancestral species of Zingiberales (the fifth stamen is aborted in the Zingiberaceae and the sixth remains fertile; Kirchoff, 1988). *Globba* flowers are distinctive in having a relatively small staminodal labellum and a greatly elongated, arched stamen that is as long or longer than the floral tube and staminodes. However, the hallmark of most (90%) *Globba* species are the small linear to triangular appendages along the sides of the anther. The colorful bracts and flowers seen in many species are useful taxonomically and have attracted horticultural interest, especially for *G. winitii* C. H. Wright (Williams et al,1999). Most, if not all, species of *Globba* can reproduce through the production of asexual vegetative bulbils in the inflorescence, a rare occurrence in the rest of the family (Larsen et al., 1998). In some species (e.g., *G. marantina* L. and *G. bulbifera* Roxb.) seeds are rarely produced and plants produce bulbils as their primary means of reproduction. After the flower is pollinated and fertilized, a hard-shelled seed develops, which remains dormant until the next rainy season. Because, Suberin and pectin compounds give the seed shell its toughness. Water and air cannot pass through to the inside, so the seed does not sprout readily (Seliger and Mc Elroy, 1995). Multiplication New Shoots from Embryo Culture on Globba spp. has been reported by Jala *et al*. (2013).

Mature *globba* seeds remain dormant for a long time and have a low germination rate, which is an obstacle to commercial production. Presently, some new hybrid varieties have been created by crossing between different genera. However, these hybrid varieties are even more difficult to propagate due to problems of low germination, sterility or seed abortion. Plant tissue culture is a promising approach to overcome these difficulties. For instance, an embryo rescue technique, in which young embryos are cultured on synthetic media, is one method to increase the number of plantlets. Also, trimming the seed coat to break dormancy followed by micropropagation can yield a large number of plantlets within a short period.

The objectives of this research were to find suitable methods for trimming young *Globba winitii* seeds. During the embryos of seed embryos were often cut and destruction from equipment. Our goal is to culture them to increase the percentage of germination and obtain rapid shoot emergence in a short period.

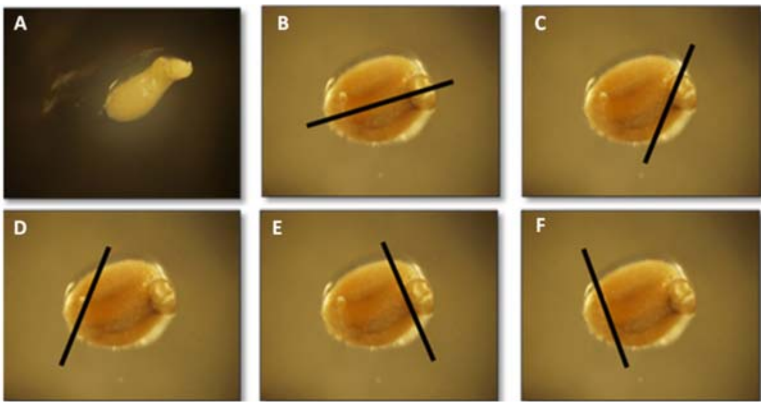

Figure 1: The position of *Globba winitii* (commercial white) seed, treated by trimming at different parts

(A) Naked embryo (B) Trimmed at the middle seed

(C) Trimmed one side of the micropyle (D) Trimmed one side at the base across micropyle

(E) Trimmed at the micropyle side (F) Trimmed at the end across micropyle

2. Materials and Methods

Young *Globba winitii* seeds at 20 days after pollination were collected and cleaned with liquid detergent, washed under running tap water for 15 min, soaked in 70% alcohol for 1 min and sterilized in 20% Clorox for 20 min, followed by 10% Clorox for 10 min and finally soaked with sterilized distilled water 3 times, 1 min each time. The seeds were randomly divided into 6 treatment groups that were trimmed at different parts of the seed: trimmed down to a naked embryo, trimmed at the end of the micropyle, trimmed on one side of the micropyle, trimmed at the base across the micropyle, trimmed on one side at the base and across the micropyle and not trimmed (control) (6 treatments as shown in Figure 1). All seeds were cultured on MS medium supplemented with 10 mg/l BA, 1 mg/l NAA, 10 mg/l GA_3 and 30 g/l sucrose. The medium was solidified with 0.8% agar after adjusting the pH to 5.6 and sterilized by autoclaving at 121° C (1.06 Kg^{-1} m^{-2}) for 20 min. The cultures were maintained at 25 ± 2° C under a 16-h photoperiod with illumination provided by cool fluorescent lamps at an intensity of 60 $\mu molm^{-2}$ sec^{-1} (TLD 36 w/853350 lm Phillips Thailand). Cultured seeds were subcultured into the same medium every 2 weeks to induce growth. After all seeds germinated, the embryos were transferred to MS medium supplemented with 2 mg/l BA for growing.

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3. Statistical Analysis

Experiment was set up in Completely Randomized Design (CRD) with 6 treatments; each treatment consisted of 20 replicates for the experiment. The test of statistical significance was done by applying Duncan's Multiple Range Test (DMRT) at 5% confidence level using SAS statistical software, Release 6.03 (SAS Institute Inc., Cary, NC).

4. Results and Discussion

After trimming young *Globba winitii* seeds at various parts of the seed and culturing them on MS medium supplemented with 10 mg/l BA, 1 mg/l NAA, 10 mg/l GA_3 and 30 g/l sucrose, (They affect cell elongation by altering cell wall plasticity. They stimulate cambium, a subtype of meristem cells and affecting enzyme production that mobilizes food production used for growth of new cells in aleurone layer) the percentage of germination observed in trimmed seeds was significantly different from the control in the first and second week, as shown in Table 1.

Table 1: Germination Percentage of young *Globba winitii* seed trimmed at different part of seeds after culturing for two and three weeks. (Mean ±SD)

Method for trimmed	Percentage of germination *			GI*	SE (%)*
	1st week	2nd week	3rd week		
Naked embryo (control)	98.03±3.39 c	98.03 ± 3.39 d	98.03 ± 3.39 d	22.06 c	100 c
No trimmed (intact seed coat)	00.00 ±0.00 a	0.00±3.39 a	00.00 ±0.00 a	0 a	0 a
Trimmed at the micropyle side	78.33±3.37 c	96.66 ± 5.77 d	96.66 ± 5.77d	18.094c	83.56c
Trimmed at the base across the micropyle	72.03±1.38c	82.61 ±8.20 d	84.62 ±8.20 d	16.191c	74.518b
Trimmed one side of the micropyle	34.90 ±1.87b	55.08 ±1.84 c	56.10 ±1.84 c	8.818b	62.073b
Trimmed one side across the micropyle	68.69 ± 1.09c	85.00 ± 7.98 d	86.00 ± 7.98 d	15.887c	80.773c
Trimmed at the middle seed	1.33 ± 2.33 a	31.50 ± 1.04 b	31.50 ± 1.04 b	2.44 a	4.222 a

* significant difference ($p \leq 0.05$)
abc Average compared mean within column by Duncan's multiple range test at ($p \leq 0.05$)
GI = germination index was calculated as described by Association of Official Seed Analyst (AOSA,1991)
SE = Speed of emergence was calculated according to ISTA (1996)

This result (Table 1) confirms the theory that the dormancy period is affected by the hardness of the seed coat (Chien and Lin, 1994). When the seed coat was trimmed, it let water and oxygen pass through the seed coat to reach the micropyle and the embryo directly (Figure 2). With other species, scarification or other treatments to break down the impermeability of the seed coat have been shown to shorten dormancy and result in germination in a relatively short time. For instance, *Lupinus hispanicus* seed has been reported to have long dormancy due to the seed coat (Centenera et al., 1999).

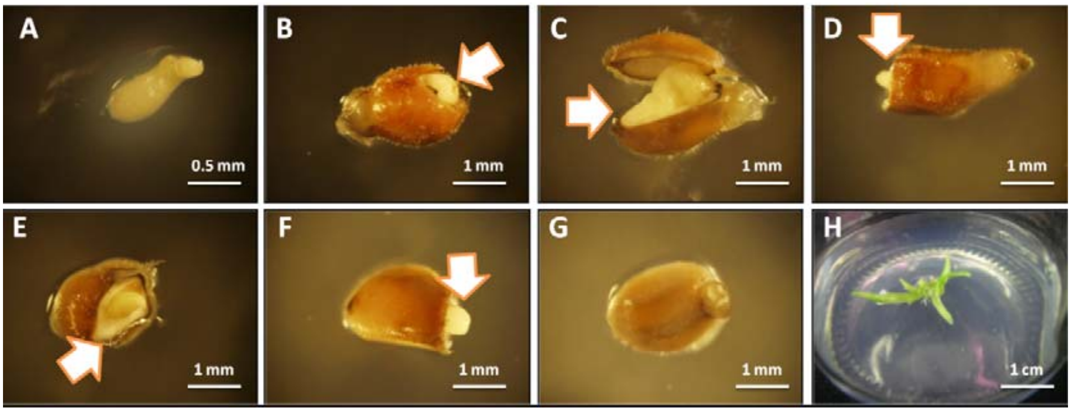

Figure 2: Young *Globba winitii* (commercial white) seed which treat by trimming at different parts of seed after culturing 3 weeks.
(A) Naked embryo, (B) Trimmed one side at the base across micropyle,
(C) Trimmed at the middle seed, (D) Trimmed at the end across micropyle,
(E) Trimmed one side of the micropyle (F) Trimmed at the micropyle side,
(G) Trimmless (Whole seed - no trimmed), and (H) Young plantlets from embryo.

In the present study, scarification (by way of trimming) resulted in the greatest imbibition, germination percentage, seedling establishment and also the highest values of seedling growth characteristics compared with untreated (control) seeds. However, partially trimming the seed did not improve the seed coat permeability much, and resulted in a low germination percentage (Table 1). The methods of trimming at the middle of the seed or trimming at one part of the micropyle gave the lowest percentages of germination at 1.33% and 34.9%, respectively. One possible explanation for this is that trimming at the middle of the seed may destroy or injure the embryo. From research by Eeckhaut et al. (2007), had done on *Rhododendon* which harvested 10 weeks after pollination and initiated in vitro, showed that seeds from inter-generic crosses had larger endosperm and the number of rescued embryos that germinated into new plantlets was greater. This research was similar to a report by Lili et al. (2008) on hybrid seedless grape (Emerald Seedless x Beichun), in which hybrid fruits were harvested 3 days after pollination and young embryos were cultured on WPM (woody plant medium, Lloyd and McCown, 1980). They obtained a high survival rate and new hybrid plants.

In the second week of this study, the germination index was again higher for the treatment groups of trimmed globba seeds than for the untrimmed control. This is compatible with results from the research of Jala (2011), Ellis and Robert (1981), Hangarter (1996), Warpeha and Kaufman (1989) and Winslow (1999), who reported that many plant species respond to the environment with optimal growth and development according to the availability of light, water and oxygen. In our experiment, the final germination percentage

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was higher for the bare embryo seed group than for either trimmed or intact seeds, with a statistically significantly difference among treatments (naked >trimmed >intact).

Partially trimming the seed coat or completely removing the seed coat apparently relieved any mechanical restraint and/or barriers to gas exchange, as these treatments greatly improved germination, just as they did of Genesis in a report by Duval and Ne Smith (2000). Comparing the mean germination rates of each seed coat trimming treatment, we found statistically significant differences. The group of seeds that was partially trimmed at the micropyle part and the group that was trimmed on one side across the micropyle both gave similar results, as shown in Table1. This result indicates that the seed coat was the major obstacle to seed germination. This is probably because the thick seed coat prevents water and oxygen from entering into the seeds. When the seed coat was removed, there was nothing to shield the inside. Water and oxygen could enter, stimulating the metabolism of the embryo to germinate into a seedling. When the germination index of each treatment was calculated, significant differences were found. Naked embryos had the highest germination index at 22.06 and the control group with intact seed coats had the lowest. In addition, the highest speed of emergence was recorded for the naked seed group, which was 100%. Data for speed of emergence followed the same trend as for germination index. This research agrees with Jala (2012) research on *Nepenthes mirabilis*. The speeds of emergence in young seeds which were trimmed at the micropyle part and those that were trimmed on one side at the base across the micropyle were the next fastest after the naked seed group.

5. Conclusion

Young embryos could be induced to germinate by trimming the young seeds at 20 days after pollination to break seed coat dormancy. Immature embryos could germinate within the first week and naked embryos with the seed coat entirely removed showed the highest germination percentage, germination index and seed emergence rate at 98.03%, 22% and 100%, respectively. But, Trimming at the micropyle side of the *Globba* seeds is the best method for enhance germination and got shot time which the same as the naked embryos. Explants from *globba* varieties cultured on MS medium supplemented with difference BA gave non significance difference in this experiment. But, Khao Burma cultured on MS medium supplemented with 2 mg/l BA gave the highest average number of new shoots at 4.33 shoots, while varieties G-75, G-52, G-08 and commercial white cultured on MS medium supplemented with 5 mg/l BA gave the highest average number of new shoots at 8.66, 5.33, 5.33, and 5.33 shoots, respectively.

6. References

Association of Official Seed Analysis (AOSA) (1991) Seed Vigor Testing Handbook. Contribution. No.32 to the handbook on Seed Testing, published by AOSA and SCST, USA.

Centenera, E., C. Cuadra, C. de la, de la Cuadra and G.D. Hill. (1999) Control of seed viability in *Lupinus hispanicus*. Towards to 21st Century. Proceedings of the 8th International Lupin Conference, Asilomar, California, USA, May 11-16 1996, 416-419.

Chien, H. and T.P. Lin, (1994) Mechanism of hydrogen peroxide in improving the germination of *Cinnamomum camphora* seed. Seed Sci. Technol. 22: 231-236.

Duval, J.R., and D. S. Ne Smith, (2000) Treatment with hydrogen peroxide and seed coat removal or clipping improve germination of "Genesis" triploid watermelon, HortScience, 35: (1): 85-86.

Eeckhaut, T., E. D. Keyser, J. V. Huylenbroeck, J. D. Riek, and E. V. Bockstaele. (2007) Application of embryo rescue after interspecific crosses in the genus *Rhododendron*, Plant Cell, Tissue and Organ Culture, 89: 29-35.

Ellis R.A. and E.H. Roberts. (1981) The quantification of ageing and survival in orthodox seeds, Seed Sci. Technol., 9: 373-409.

Endress, P. K. (1994) Diversity and evolutionary biology of tropical flowers. Cambridge University Press, New York, New York, USA.

Hangarter R.P. (1996) Gravity light and plant form. Plant Cell Environment. 20: 796-800.

ISTA (International Seed Testing Association) (1996) International rules for seed testing. Seed Sci Technol, 24: 155-202.

Jala, A. (2011) Role of BA and NAA on callus and shoot induction of *Globba winitii* L., The 10th National Horticultural Congress 2011. May 18-20, 2011. At Miracle Grand Hotel. Bangkok, Thailand.

Jala, A. (2012) Type of media for seed germination and effect of BA on mass propagation of *Nepenthes mirabilis* Druce., American Transactions on Engineering & Applied Sciences, 1: (2) : 163 -171.

Jala, A., N. Chanchula, and T. Taychasinpitak. (2013). Multiplication New Shoots from Embryo Culture on Globba spp. INT TRANS J ENG MANAG SCI TECH, 4(3): 207-214.

Kress, W. J., L. M. Prince, and K. J. Williams. (2002) The phylogeny and a new classification of the gingers (Zingiberaceae): evidence from molecular data. *American* Journal of Botany 89: 1682–1696.

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Larsen, K., J. M. Lock, H. Mass, and P. J. M. Maas. (1998) Zingiberaceae. In K. Kubitzki [ed.], The families and genera of vascular plants, vol. IV, 474–495. Springer-Verlag, Berlin, Germany.

Lloyd, G. and B. McCown. (1980). Commercially feasible micropropagation of mountain laurel, *Kalmia latifolia* by use of shoot tip culture. Proc. Intl. Plant Prop. Soc., 30: 421-427.

Lili T., Y.Wang, Y. Nui, and D.Tang. (2008) Breeding of disease-resistant seedless grapes using Chinese wild *Vitis* spp. I. In vitro embryo rescue and plant development, Scientia Horticulturae, 117: 136 - 141.

Murashige T. and Skoog, F. (1962) A revised medium for rapid growth and bio-assays with tobacco tissue culture, Physiology Plant, 15: 473-474.

SAS, "SAS/STAT User' Guide,". Release 6.03. 2000, SAAS Institute Inc., Cary, NC.

Seliger, H.H., and Mc Elroy, W.D. (1995) Temperature and Plant Development, Pp.407-419. Introduction to Plant Physiology, John Wiley & Sons, Inc., New York.

Warpeha K.M.F., and L. Kaufman. 1989. "Blue-light regulation of epicotyl in *Pisum sativum*," Plant Physio., Vol. 89, , pp. 544–48.

Williams K. J., W. J. Kress and P.S. Manos. (2004). The Phylogeny,Evalution, and Classification of the Genus Globba and Tribe Globbeae (Zingiberaceae): Appendages do Matter. American Journal of Botany 91(1): 100–114.

Winslow R. Briggs and Eva Huala. (1999) "Blue-light Photoreceptors in higher plants," Annu. Rev. Cell Dev. Biol.. Vol. 15: 33–62.

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Using Adobe Photoshop to Scale the Rate of the Shape's Deformation By Colour Contrast Application

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ABSTRACT

Interior designers are quite cognizant of the colour significance as a basic element of design, in order to achieve aesthetic and functional demands. This paper aims to present an empirical model for interpreting the relationship between the colour' contrast and highlighting the foreground objects, by measuring the values of the deformation via using Adobe Photoshop software. The experiment contained practical steps of calculation and analysing the amount of the chromatic deformation of the foreground objects, which is represented by 6 samples model. These samples of coloured spots are tested within two phases; with coloured background based on *Itten colour wheel*, and with a neutral background "greyscale wheel"; and comparing the results by calculating the amount of distortion, through measuring angle's values. The findings showed that using of contrast application is useful as an empirical method for scaling the chromatic interaction between the foreground and the background. By using T-Test analysis the findings emphasized that the colour contrast had a significant impact on highlighting or distorting the foreground shapes.

1. Introduction

Adobe Photoshop is well known leading photo-editing software. It includes a wide range of standard filters, effects, and advanced variety of editing applications.

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The contrast is one of these techniques, it can be used to increase or decrease the ratio of colour contrast (Marinia & Rizzib, 2000). The experiment is a test under controlled conditions, that is made to prove a known fact, determine the effectiveness of something is restricted in the past, or to test the validity of a hypothesis (Shadish, Cook et al., 2001).

This study is not attempting to reinvent the wheel, but it is presenting an empirical scale for measuring and explains the interaction between the background and the foreground objects, positively “highlighting”; or negatively “Chromatic Deformation”, by expanding the contrast slider in Photoshop see Figure 1, and recording the amount of changes on the experimental samples. There are many of visual applications of colour contrast, where were themes of many studies deal with colour contrast from different perspectives such as the role of colour contrast in occupational safety, warning symbols’ design, design of safety apparel, workplaces Design and Ergonomics (Sayer & Mefford, 2000).

The objective of this experiment is to study the deformation amount of the foreground shapes “coloured spots”, and how the coloured background affects the foreground shape, via the contrast function, and compare the results in both of cases pretest and posttest. This article contained the terminology, methodology, analysis, discussion of results, and conclusion.

2. Terminology

2.1 Adobe Photoshop

Photoshop is one of most important professional softwares manufactured and developed by Adobe Systems Inc. It is used for images' printing, editing, add effects and designing via some of the innovate tools that have a deep impact to design and projects (www.businessdictionary.com ; Adobe Systems Inc, 2005).

2.2 The Contrast

The contrast is the visual properties difference that makes the object in image recognizable from the background (Campagna, Mergler et al., 1995). The contrast plays a vital role in presenting the image colours and the level of brightness or darkness tones in a scene. It had a significant effect on the clearness of colours; otherwise the image will be appearing too grey or dull (Marinia & Rizzib, 2000). According to George (1985) the contrast had an impact on the heighten awareness, whether greyscale image by highlighting the foreground against the background; or coloured image showing the strong effect especially with colours like red and yellow appearance against the background. It can be summarized that the function of contrast is widening the chromatic gap between the bright and dark hue within the limitations of the image.

2.3 The Contrast Application by (Adobe Photoshop)

The contrast application in Adobe Photoshop software comes within the (Brightness/Contrast) adjustment box, as in Figure 1. This application helps the user to adjust the tonal range of images. The contrast slider can shrink or extend the value of the image's tonal. The normal mode of this application (Brightness/Contrast) adjusts the image layer in proportionate (nonlinear), such as adjusting the levels and the curves (http://help.adobe.com).

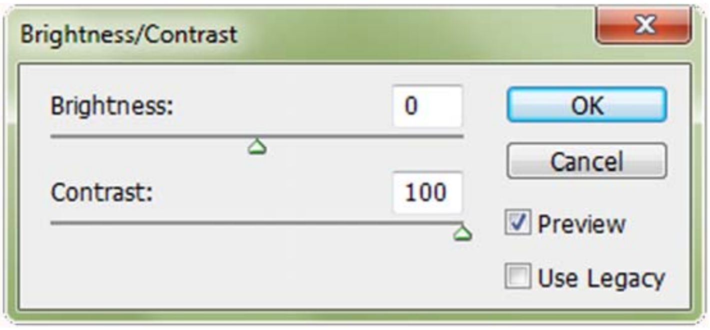

Figure 1: The slider adjustment for Brightness/Contrast box (Adobe Photoshop).

2.4 Itten Colour System

Johannes Itten in his book "The Elements of Color" described his colour system, which consists of 12-hues colour wheel as in Figure 2. He developed his wheel from the three primary colours yellow, red, and blue. The three primary colours were formulated as an equal triangle; at the top (yellow), at the lower right (red), and the (blue) in the lower left. The three primary colours generate the three secondary colours as followed: yellow + red = orange, yellow + blue = green, and red + blue = violet. The six colours forms a regular hexagon, (primaries and secondaries) all together generates the 12-hues colour wheel by sequential mixing such a rainbow or natural spectrum (Itten, 1970).

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3. Methodology

There are many phenomena relates to the visual perception were accepted as realities, some of which have not yet been resolved because it is not subject to empirical scale. The rationale of this experiment is to develop a measurable model inspired from Itten colour theory (Figure 2), to explain empirically the relationship between the colour and the highlighting the foreground.

3.1 The Experiments Procedure

The experiment required to test the model that developed as in Figure 2:

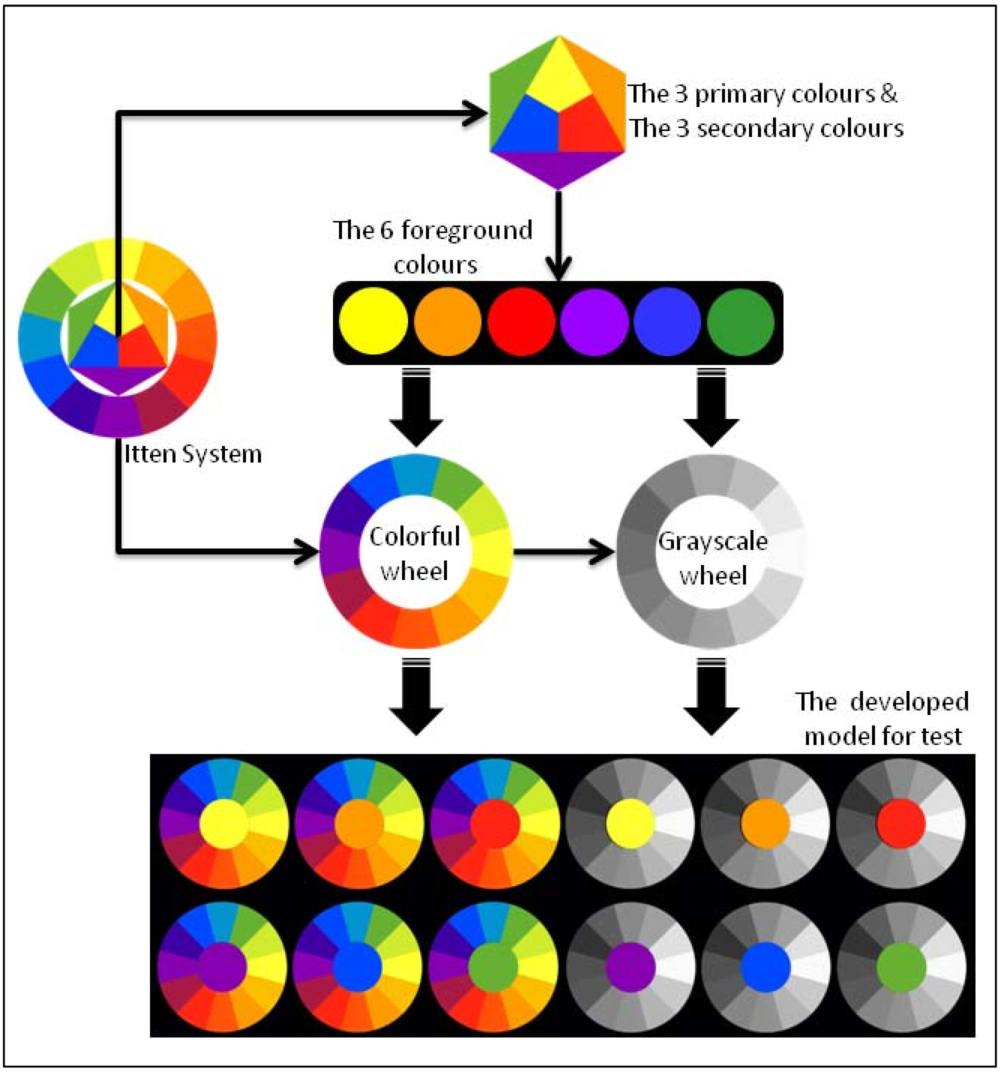

Figure 2: The test model.

The model contained 12 colour samples inspired from Itten theory. These samples are three primary colours (yellow, red, and blue) in addition to the secondary colours (orange, violet, and green). The six samples are tested with colourful backgrounds; and six samples with neutral (greyscale) as in Figure 3.

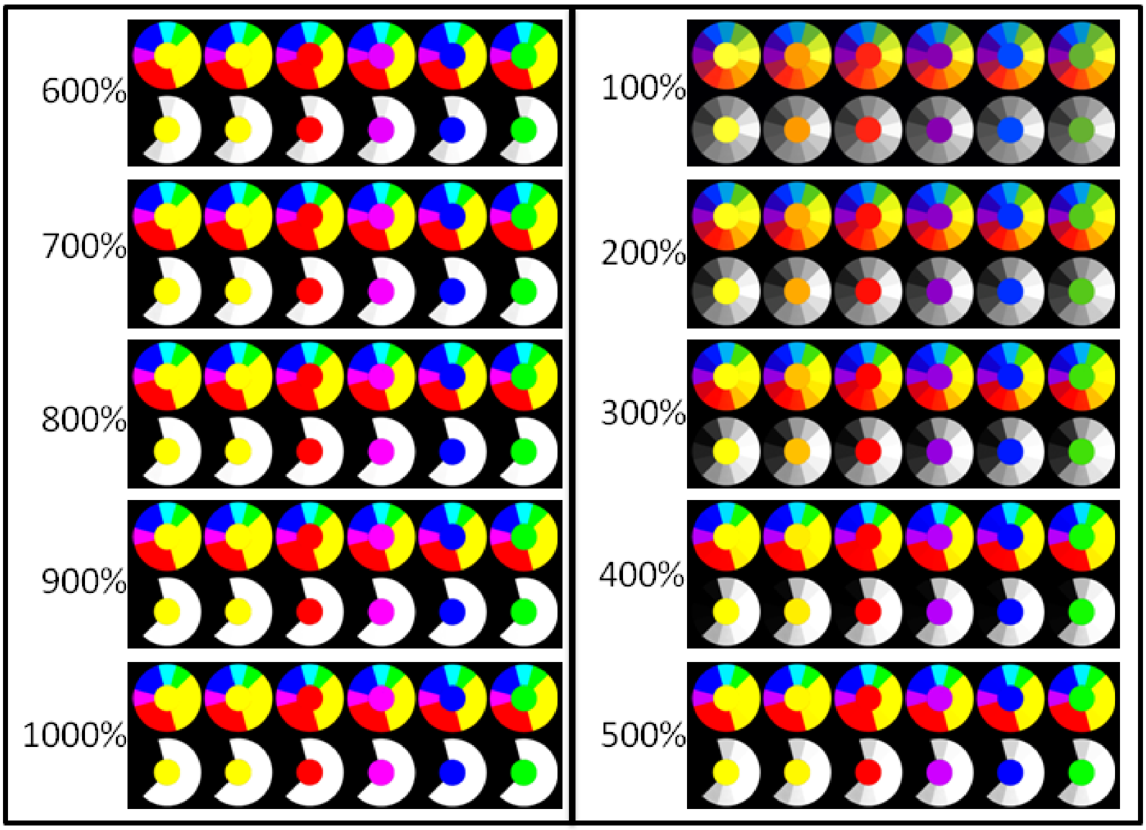

Figure 3: The contrast sequence from 100% to 1000% value

By using Adobe Photoshop software, the model in Figure 2, tested with the contrast application. The test requires repetition the contrast function for 10 times, in order to reach the 1000% and observe the change of the model under the effect of the contrast, as in Figure 3.

3.2 The result of 1000% contrast showing the difference after and before the contrast application as in Figure 4. Initial Observations

After applying the contrast experiment as shown in Figure 3, and 4, the initial observations are as follows:

- In Figure 3, the samples with coloured background, after applying contrast (500%) will be never changed; unlike the neutral
- In Figure 4, the samples in column 2 (the orange spots), orange colour changed to yellow after contrast function, so that the researchers excluded orange spots as (neglected samples).

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- The spot's shapes of samples with neutral backgrounds, in both of the cases (pretest and posttest) didn't distort the colour spots.
- The spot's shapes of samples with coloured backgrounds in pretest phase have been an equal amount of deformation; and after applying the contrast function posttest phase there are distorted due to the background colours deformation.

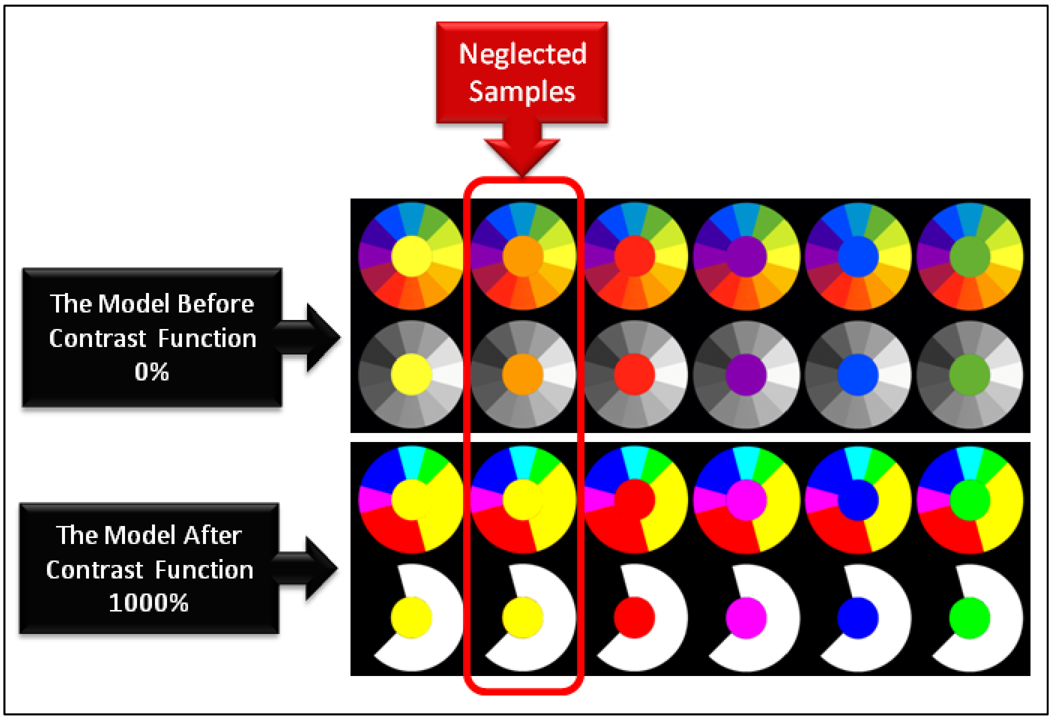

Figure 4: The difference between the model before the contrast and after 1000% contrast

3.3 Justifications

Researchers were keen to get an acceptable level of validity and reliability by provoking the following questions:

3.3.1 Why Contrast?

As is well known, that the contrast is important for distinguishing the features and highlighting objects (Wang, Giesen et al., 2008). The researchers assumed that there is a significant relationship between the colour contrast and highlighting foregrounds. This assumption is based on the logical relationships between the colour and the attracting the attention that proved by using the "*Photo Album Test*" (Al-Helly & Fuziah, 2013).

3.3.2 Why not applying the (Use Legacy)?

In Figure 1, the Brightness/Contrast box, the option of "Use Legacy" is not activated, the reason is that the use legacy option shifts all pixel values higher or lower, that function will clip or lose some details of the image, deforming the shape by highlighting or shadowing image components According to Adobe, this option is not recommended, it is just useful for mask editing and some scientific applications (http://help.adobe.com).

3.3.3 Why use the circular shape?

The coloured circular shape used in this experiment, it is the simplest systematic shape that can be used for experimental models as a focus, the colours distribute more regularly (Al-Helly & Fuziah, 2013), this shape is a measurable to scale the deformation angles on the other hand.

3.3.4 Why the Contrast rate is 1000%?

The justification for the using contrast function till 1000% is to the limit the function. In other words the contrast after 1000% value, will not give any visual changes.

3.3.5 Why Using *Itten System*?

Instead of using *Itten system*, a virtual colour wheel, of 12 colours is created for the reliability of the experiment as shown in Figure 5.

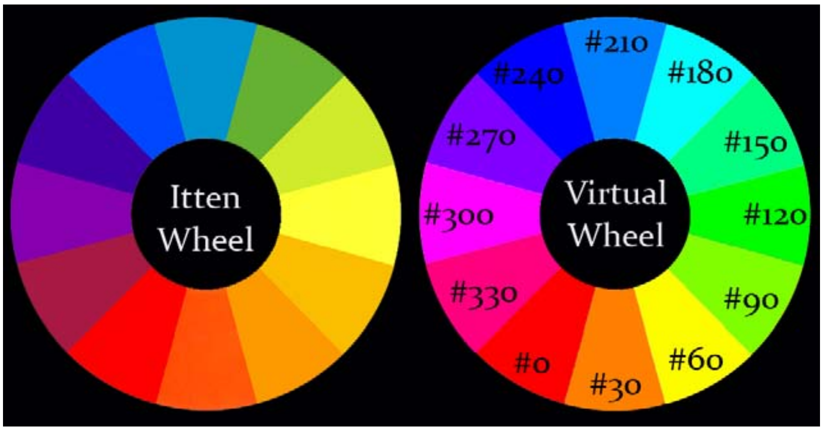

Figure 5: Itten and the virtual wheels

__Notes__: the values of the hue sequenced from (0# to 330#) instead of (0# to 360#); in-fact the values of 0# and 360# have the same hue (Red colour), as the colour circle start and end at the same point.

Despite the systematic procedure that adopted by researchers to obtain the reliable colour wheel for the experiment, consist of 12 values (0# to 330#); The virtual wheel was neglected by the researchers due to the visual quality of contrast among the 12 colours, the Hues visually seem unrecognizable due to the contrast gap among them. Within Itten wheel, the colour hues visually seem more acceptable due to the contrast gap among the 12 colours.

4. The Analysis

Figure 6, presents a comprehensive description for applying the contrast function. It shows the deformation amount for the samples within the experimental model in both of cases

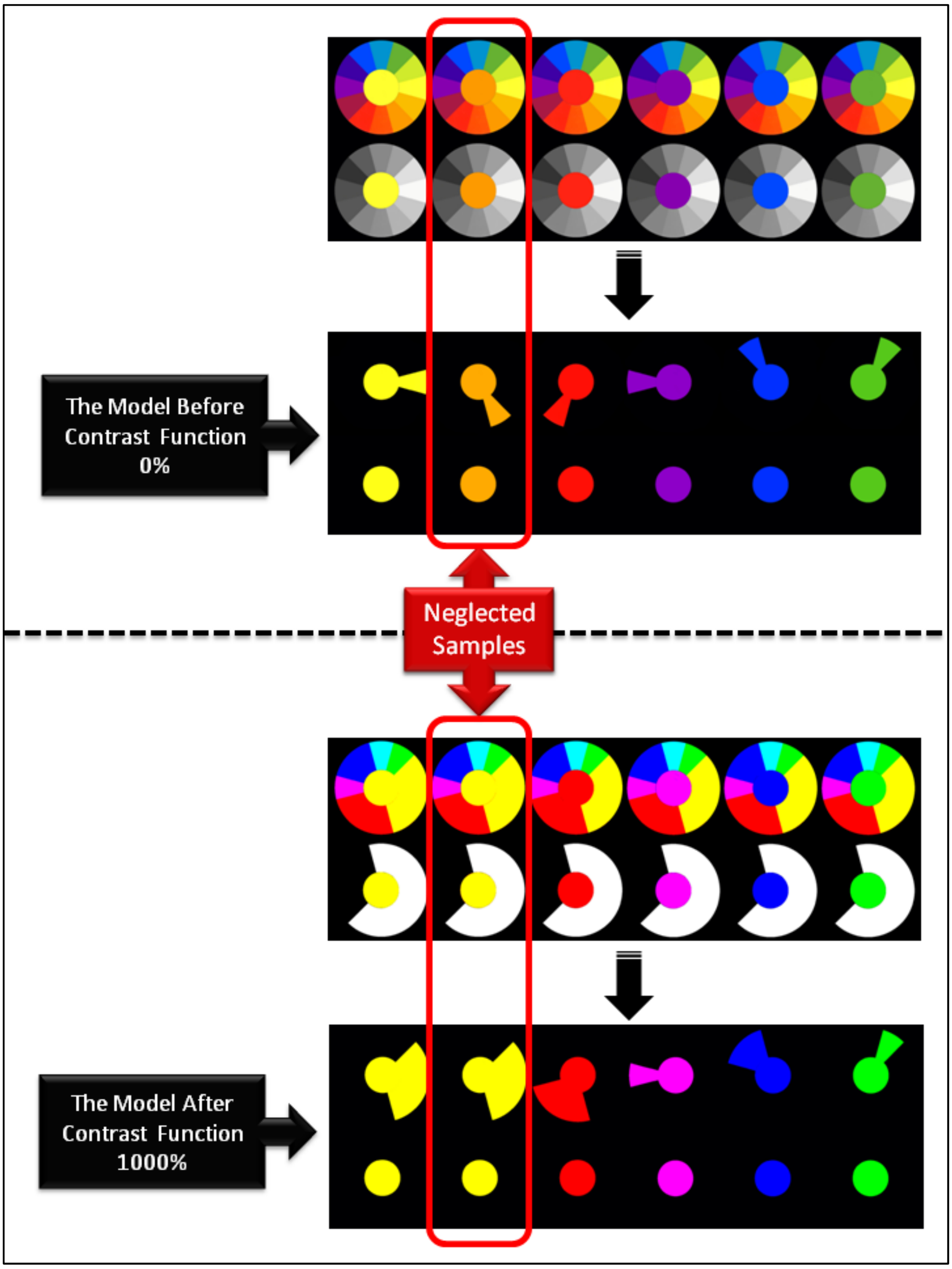

Figure 6: The result of deformation

pretest and posttest. The applying 1000% of contrast function leads to samples with measurable angles of deformation, as follows:

4.1 The Measuring Of Deformation Angles

By using the following equation, can calculate the value of deformation angle:

$$Angle\ Value = \frac{n\ 360°}{12} \tag{1}$$

Where, n = the summation of deformation colours of 12 from the Itten system. From the equation, the angles the deformation angle for each of samples before the contrast function is:

$$Angle\ Value = \frac{(1)\ 360°}{12} \tag{2}$$

The angle value of each sample before the function (pretest) is=30° as in Figure 7.

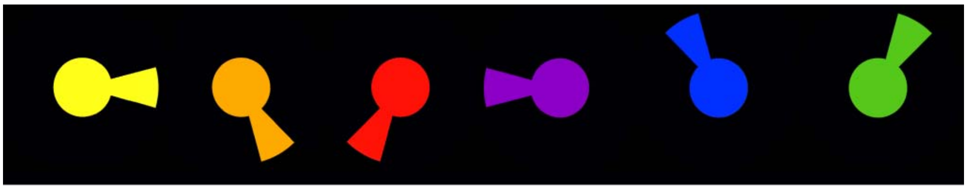

Figure 7: The angle's deformation of each sample before applying the contrast function.

5. Discussion of Results

The angle's values of the samples after applying the contrast function (posttest) calculated as follows:

Table 1: The calculation of deformation angles for each sample.

SAMPLE COLOUR		THE VALUE OF THE DEFORMATION ANGLES
1	YELLOW	(4) 360°/12 = 120°
2	ORANGE	Neglected Sample
3	RED	(www.3dstereo.com) 360°/12 = 90°
4	VIOLET	360°/12 = 30°
5	BLUE	360°/12 = 60°
6	GREEN	360°/12 = 30°

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As presents in Figure 8, the deformation of samples with coloured backgrounds have varied angle’s values depending on the amount of deformation backgrounds under the contrast function of each sample.

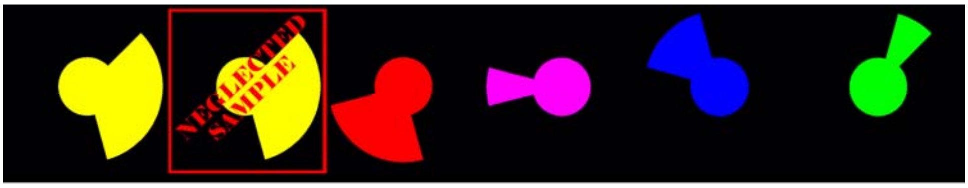

Figure 8: The angle’s deformation of each sample (with coloured backgrounds) after applying the contrast function.

Table 2: The Average and T-Test, for pretest and posttest samples.

Colour	Pretest samples	Posttest samples
Yellow	30	120
Red	30	90
Violet	30	30
Blue	30	60
Green	30	30
Average	30	66
p-value	0.05435	

From Table 2:

The average of pretest samples = 30

The average of posttest samples = 66

For T-Test that the value of p= 0.05435.

6. Conclusion

Table 1 showed that the amounts of angles deformation have varied depending on the amounts of contrast affection. The experiment results emphasized that the expanding of the contrast slider showing clearly the visual deformation of samples with coloured background; unlike the expanding of the contrast slider never changes the shapes of the samples with neutral (greyscale) background.

In Table 2, the T-Test results showed the difference between the averages of pretest and posttest samples (30 and 66). The value of p = 0.05435 proves that the experiment presented visual evidence:

- The colour contrast has a significant impact on highlighting the foreground objects with neutral (greyscale) background.
- The colour contrast has an impact on deforming the shape of foreground objects due to the chromatic interaction between the foregrounds and the backgrounds.

Figure 9 shows the variance of experimental samples. And the deformation amounts for each sample of five colours (3 primary and 2 secondary colours). The orange colour sample was excluded for more reliability of the test.

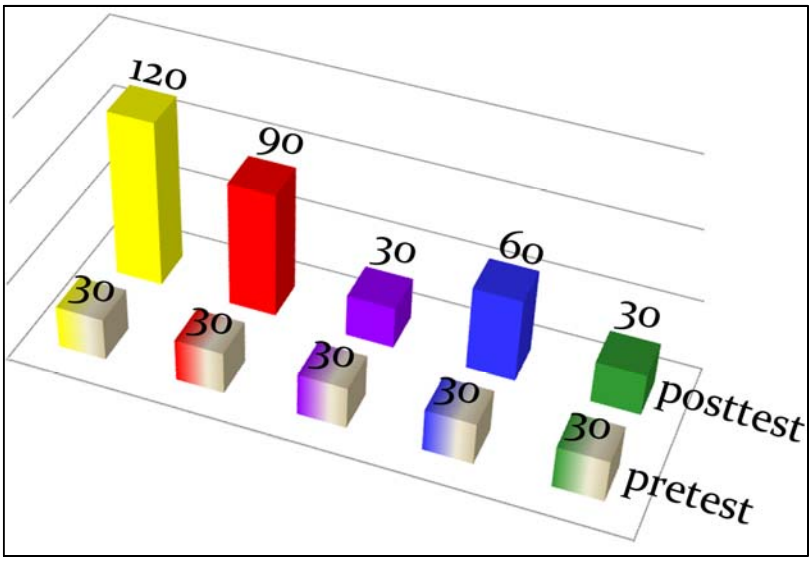

Figure 9: Chart presents the samples pretest and posttest.

7. Acknowledgements

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8. References

Adobe Systems Inc (2005). Adobe Photoshop cs2 overview. San Jose/ USA.

Al-Helly, F. and Fuziah (2013). "Using the Photo Album Test, To Scale a Visitor Attention in

Car Showroom." International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies 4(1): 67-79.

Campagna, D., D. Mergler, et al. (1995). "Visual dysfunction among styrene exposed workers." Scand J Work Environ Health 21(5): 382-390.

George, D. (1985). The art of underwater photography, British Society of Underwater Photographers.

http://help.adobe.com. "Apply a Brightness/Contrast adjustment." 2013, from http://help.adobe.com/en_US/photoshop/cs/using/WS6F4BFD05-7169-4fda-9003-3751F79CEC70.html#WSfd1234e1c4b69f30ea53e41001031ab64-764ea.

Itten, J. (1970). The Elements of Color, JOHN WILEY & SONS, INC. .

Marinia, D. and A. Rizzib (2000). "A computational approach to color adaptation effects." ELSEVIER 18(13): 1005–1014.

Sayer, J. R. and M. L. Mefford (2000). THE EFFECT OF COLOR CONTRAST ON DAYTIME AND NIGHTTIME CONSPICUITY OF ROADWORKER VESTS University of Michigan, Transportation Research Institute, Ann Arbor, MI 48109-2150 U.S.A. . UMTRI-2000-35

Shadish, W. R., T. D. Cook, et al. (2001). "Experimental and Quasi-experimental Designs for Generalized Causal Inference."

Wang, L., J. Giesen, et al. (2008). "Color Design for Illustrative Visualization." IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS 14(6).

www.businessdictionary.com. "Photoshop Definition" 2013, from http://www.businessdictionary.com/definition/Photoshop.html.

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Shading and Extent of Sunlight Penetration on House Facades of the Early Terraced House Type in Petaling Jaya Old Town, Malaysia

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ABSTRACT

The aim of this study is to evaluate shading performance and the extent of sunlight penetration on the front house facade of the earliest terraced houses in Malaysia built in 1950s. Two house facades are selected for the case study located in Petaling Jaya Old Town, the first Garden City's new town in Malaysia. The survey applies sunlight simulation technique using the SunTool programme. The simulation calculates at hourly interval from 7.00am to 6.00pm. The study finds that terraced house facades built in 1950s do not sufficiently design to tackle the house facade exposed to direct sunlight. The emphasis of façade design built in 1950s is more on the architectural style rather than designing efficient shading devices to tackle direct sunlight penetrating to the façade wall and windows. Roof overhang and recessed wall with balcony are the horizontal shading elements commonly used in the house façade design. No vertical shading device was applied to the façade design during 1950s.

1. Introduction

This study analyses shading areas and sunlight penetration to facades of terraced houses in Petaling Jaya Old Town. The selected facades for the case study are at Section 6, and Section 3 in Petaling Jaya (Figure 1), Selangor about 15 km from Kuala Lumpur. Both houses were

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built at southern part of Petaling Jaya (PJS). Section 1 to 8 is also known as Petaling Jaya Old Town because these areas were the earliest settlements built in 1953, 4 years before the country independence. Petaling Jaya is the first Garden City's new town in Kuala Lumpur as well as in Malaysia built under Decentralised Programme to curb city population's overcrowding problem in Kuala Lumpur (Hassan, 2005). The selected terraced houses typify an early type of terraced house design in Malaysia. The house design adopts Garden City character with reference to a model of simple cottage design from England introduced by architect Raymond Unwin and Barry Parker (Hassan, 2005; Hall, 1988). The new town is located in the Klang Valley at southwest of Kuala Lumpur Federal Territory borders.

Figure 1: The Case Study 1 at Section 6 (left) and The Case Study 2 at Section 3 (right) in Petaling Jaya South (PJS), Petaling Jaya, Selangor.

The new town was built following the chronic population congestion in Kuala Lumpur due to uncontrolled population migration from rural area to the Kuala Lumpur City which happened dramatically since the early 19th century due to job opportunity as well as the country development towards modernisation. Petaling Jaya is the only new town built before independence under the British administration in Malaya. It was developed in the early decades of the 1950s under the Town and Country Planning Department. The concept of urban planning was adopted from the Garden City concept highlighted by a sociologist idea who was Sir Ebeneser Horward (Hassan, 2005; Hassan, 2009a). Petaling Jaya Old Town had been developed with a city centre located inside the North, East and West Ring Road as well as a small part of Sultan Street. Before independence, the Petaling Jaya City was administered under British by N.A.J. Kennedy's until he was replaced by Abdul Aziz Haji Mohd. Ali, the local Malayan slightly after Malaya's independence in 1959. According to a data from the

Department of Statistics Malaysia (2003), terraced houses are the most popular house types built in this country, which accounts more than 43% of the house types built in the urban areas in 2000 compared to detached houses, semi-detached houses, mid-rise apartments, highrise apartments and others.

2. The Case Studies

There are two terraced houses in Petaling Jaya Old Town selected in the case studies which are located about 500 metres to each other. The Case Study 1 (Figure 2) is a terraced house, the address number at No.2, Jalan 6/30, 46000 PJS6, Petaling Jaya whereas Case Study 2 (Figure 3) is located at No.9, Lorong 3/57D, 46000 PJS3, Petaling Jaya. In terms of architectural design, these terraced houses represent atypical terraced house design in Petaling Jaya Old Section which features simple cottage style design (Hassan, 2009b). The design has an influence from the architectural style of residential terraced house type in the United Kingdom popularly built in Garden City's new towns in early 1900s. The architectural style was introduced by Barry Parker with his interest to the concept of 'English Picturesque Tradition' from modern cottage architecture, featuring heritage from atypical Northern European countryside's house type (Hall, 1988). He was the architect who had designed terraced houses in Letchworth near London, England the first Garden City in the world. Terraced house design in Petaling Jaya Old Section was a showcase which imitated Garden City's terraced house types built in the United Kingdom. In terms of architecture, the design was a prototype for Garden City's housing development as argued by Hassan (2001) when it was first introduced by the British Administration during colonial era in Malaysia (Hassan and Che Yahaya, 2012). It epitomised a style featuring a simplified cottage design which had economic construction cost and less time consumed in construction with simple plan and facade design. The house had simple structural, wall, window and door construction without cosy decorative elements. Barnett (1987) argues;

"Unwin and Parker brought to their design of the Garden City the already well-established concepts of garden suburb and the model village, which in turn were a synthesis of two important design and planning concepts: the picturesque English gardening tradition with its artfully artificial landscape that was developed during the eighteenth century, and the conveniently planned cottage or villa with irregular and picturesque massing, also a late eighteenth-century invention."

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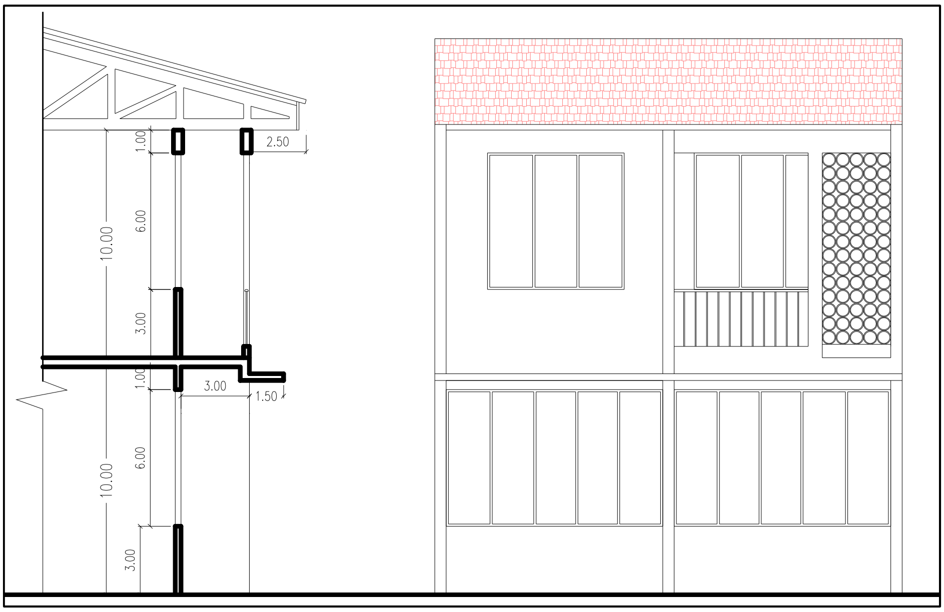

Figure 2: Section and house facade of the Case Study 1 at No.2, Jalan 6/30, 46000 PJS6, Petaling Jaya, Selangor.

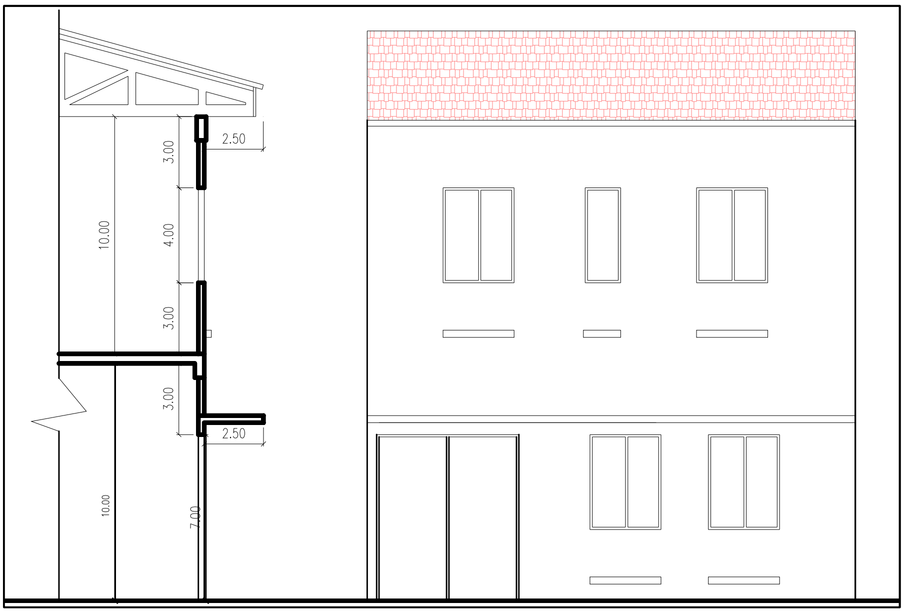

Figure 3: Section and house facade of the Case Study 2 at No.9, Lorong 3/57D, 46000 PJS3, Petaling Jaya, Selangor.

This study found that simple cottage architecture becomes a basis of modern terraced housing development in the United Kingdom and this country. The difference between terraced house style in the United Kingdom and in Malaysia is that some forms of the house elements are slightly modified with reference to the traditional Malay architecture to adjust with the local climate which has a warm and humid climate (Hassan and Ramli, 2010; Zain-Ahmed, Sopian, Abidin and Othman, 2002) compared to cool and wet climate in the United Kingdom. These elements can be seen on a roof of the house which is designed projected a few feet from the house wall's perimeter as argued by Bakhlah and Hassan (2012) creating a roof overhang and large window openings for cross air ventilation, and white and light paint colours on the plastered wall surfaces preventing the heat gains from direct sunlight (Zain-Ahmed, 2000).

Table 1: Observed time and date, and azimuth of the sun when the shade of facade was calculated for the Case Study 1 and 2 at Petaling Jaya, Selangor at latitude (N 3.1°) and longitude (E 101.4°)

Orientation	Time	Date	Azimuth
East 90°	7 am	23 March 2012	90°
	8 am	25 March 2012	90°
	9 am	27 March 2012	89.8°
	10 am	28 March 2012	90.1°
	11 am	29 March 2012	90°
	12 pm	29 March 2012	92.2°
West 270°	1 pm	16 September 2012	90.5°
	2 pm	29 March 2012	89.8°
	3 pm	18 September 2012	89.8°
	4 pm	26 March 2012	89.9°
	5 pm	24 March 2012	89.9°
	6 pm	22 March 2012	89.9°

3. Methodology

Method of the survey applies computer simulation technique using the SunTool software. The simulation will be set at a position of Petaling Jaya at latitude N3.1° and longitude E101.4° closed to the Equator. Limitation of this study is that the simulation will be conducted when the sun position has a sun path perpendicular to the house facade of the selected case studies either during morning (east) or evening (west) hours. The reason is that terraced houses are mass produced house type built with its house facade at various orientations to the sun path; as a result, its house facade simulation will be conducted only at the time at which the house facade is perpendicular to the sun path (Arab and Hassan, 2012). The objective is to measure the simulation results when the house facade has its exposure perpendicular to the sun path (Landry and Breton, 2009). Limitation of this survey exists because the position of the sun path changes from time to time (Mazloomi, Hassan, Bagherpour and Ismail, 2010). In order to get perpendicular angle of the sun path all the day hours to the east (90°) and west (270°) on the house facade, the study has calculated the required sun path using the SunTool Software. Time and date when the sun paths are perpendicular to the house facade are illustrated in Table 1. The other limitation is that there are at certain times and dates that the sun path's azimuth is not possible to have perfectly at 90° perpendicular to the house facade (Shahriar and Mohit, 2006). In these cases, the closest azimuths nearest to 90° will be used when the simulation is made in 2012 during daytime in Petaling Jaya from 7.00am to 6.00pm, which are listed in Table 1.

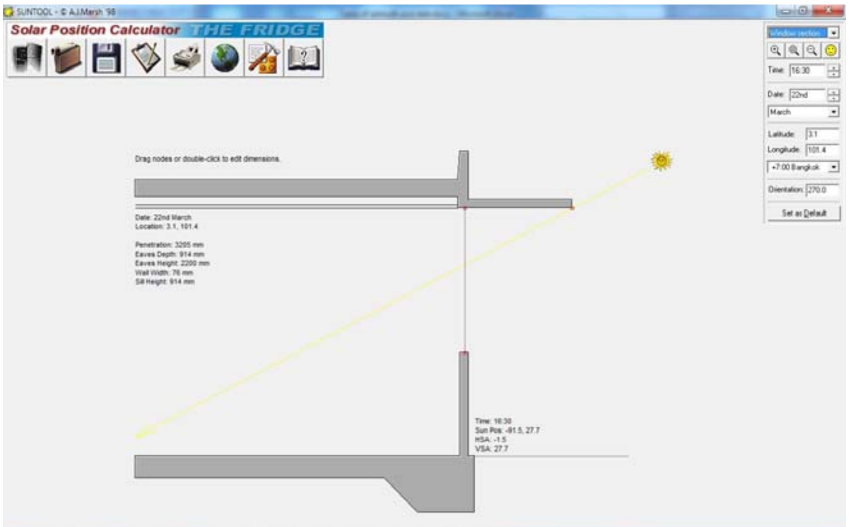

Figure 4: Simulation in SunTool programme

Table 2: Calculation of shading and exposed area.

The amount of shading and exposed area with reference to Figure 5 was calculated based on the following formula:	
$\mathbf{S_{GA} = S_{GH} \times G_W}$ Where: S_{GA} = Shaded glazing area, S_{GH} = Shading Glazing Height, G_W = Glazing Width	**(1)**
$\mathbf{S_{OA} = S_H \times L - S_{GA}}$ Where: S_{OA} = Shaded opaque area, S_H = Shading Height, L = Length of facade	**(2)**
$\mathbf{E_{OA} = T_{OA} - S_{OA}}$ Where: E_{OA} = Exposed opaque area, T_{OA} = Total Opaque Area	**(3)**
$T_{OA} = F_H \times L - T_{GA}$ Where: F_H = Floor Height, T_{GA} = Total Glazing Area	**(4)**
$T_{GA} = G_H \times G_W$ Where: G_H = Glazing Height	**(5)**
$\mathbf{E_{GA} = T_{GA} - S_{GA}}$ Where: E_{GA} = Exposed glazing area, T_{GA} = Total Glazing Area	**(6)**

All data such as the location of Petaling Jaya, facade orientation at east or west, time and date are keyed to the solar position calculator in the SunTool software (Figure 4) to get the correct position before the simulation will be made. Later, the dimensions of the house facade which are the depth of exterior shading devices, floor height, wall width and sill height are drawn in the SunTool programme. With these solar positions and dimensions of the house facade, the software will able to generate the amount of sun beam and shade on the house facade which provide the results of shading area and extent of the sunlight penetration inside the house.

3.1 Calculating Shading Area

The amount shading area are calculated at hourly interval from 7am to 6 pm when house facades are at a position oriented to east 90° and west 270° perpendicular to the sun path positions. The calculation formulas and the diagrams are shown in Table 2 and Figure 5 respectively.

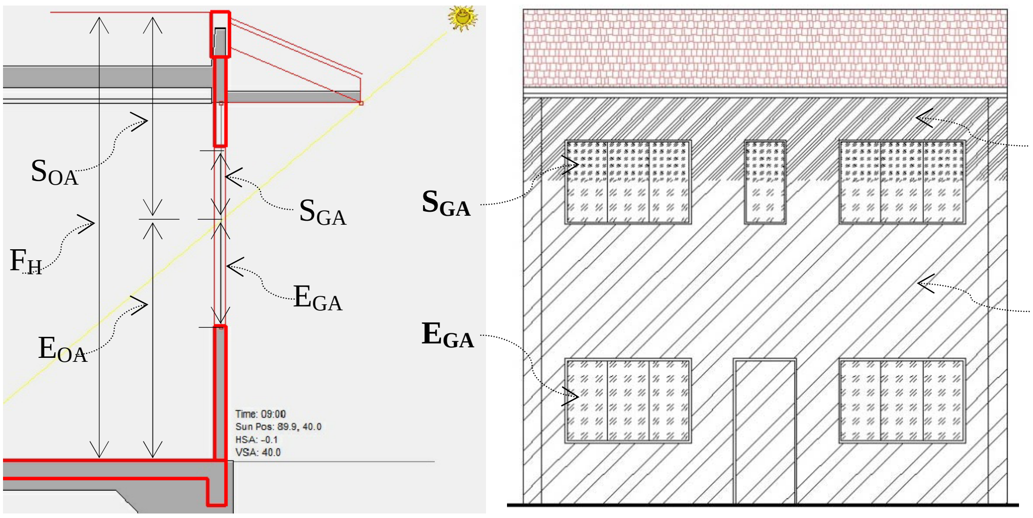

Figure 5: Abbreviations on facade and section for Table 2.

The existing wall facade is constructed with two different materials which are opaque element built with brick wall plastered with cements painted in bright colour and window glaze from glass material. The amount of shaded area of these opaque and glazing elements in addition to the extent of sunlight penetration to the indoor area of the house will be simulated in the SunTool programme. The unit of measurement used in this data is the Imperial Units because it was the standard dimension in the terraced house construction widely used in dimensioning the house plans in Malaysia before Metric Units was introduced in 1990. The SunTool programme however provides the measurements in millimetre (Metric units) in the simulations. All the results afterthat will be converted to the Imperial Units. The data will be then keyed to Microsoft Excel programme to produce graphic line and bar charts for comparative analyses, primarily discussed the results.

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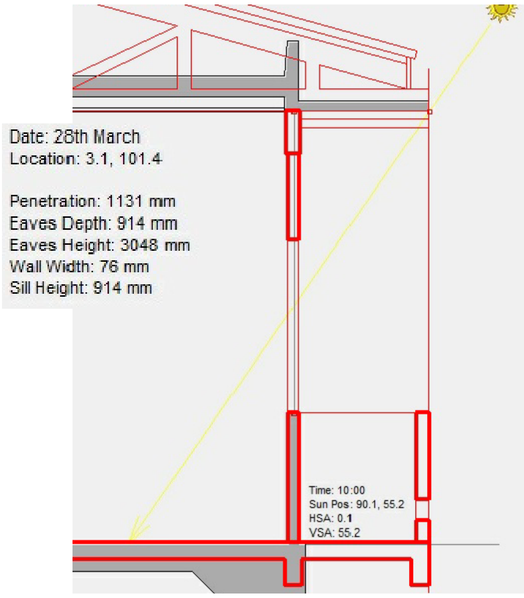

Figure 6: Extent of sun penetration given by the SunTool software.

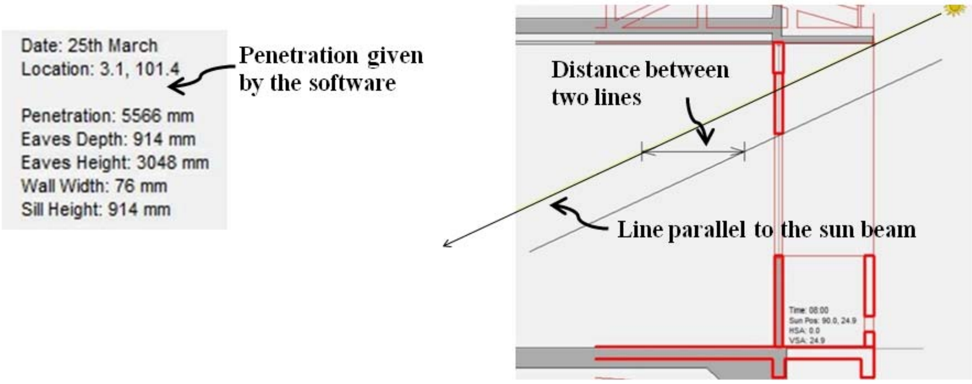

Figure 7: Method of calculation to get the exact extent of sunlight penetration inside the terraced house

3.2 Calculating the Extent of Sunlight Penetration

The simulation survey (SunTool) measures an extent of the sunlight penetration into the indoor area of the selected terraced houses in the case studies which is unblocked by the shading devices of the house facade. In a tropical climate, it is normally to have a house constructed with overhang roofs functioned as shading device (Hassan and Ramli, 2010) illustrated in the house section in Figure 6. However, there are in many cases that the extent of sunlight penetration is not only shaded by the roof overhang but also blocked by an upper window wall. To count the exact extent of sunlight penetration, another line must be drawn parallel to the sun beam at a lower part of the upper window wall as illustrated in Figure 7. A difference of the horizontal distance (x axis) between sun beam and its lower parallel line must be deducted to get the exact extent of sunlight penetration. These occasions occur in the early morning (7am to 8am) and late evening (5pm to 6pm) due to low sun angle in the sky. The calculation is as follow:

Penetration = Penetration given by the software (mm) – Distance between two lines (mm)

4. Analysis and Discussion

For the house facade selected in Case Study 1, it has the total area 414ft^2 which consists of glazed window (180ft^2) and opaque wall area (234ft^2) at the ground (storey 1) and first (storey 2) floor level. The facade at the ground floor has window area 120ft^2 and opaque wall area 87 ft^2 while its first floor level has window area 60ft^2 and opaque wall area 147ft^2. For the Case Study 2, its total facade area is 418ft^2 with window 54ft^2 and opaque wall area 364ft^2 at the ground and first floor level. The result shows that the Case Study 1 had larger shading area on its house facade than the Case Study 2. The Case Study 1 had 60% shading area on its house facade starting from 10.00am compared to 35% in the Case Study 2 before both facades were fully under shade at 12.00pm. Similar condition occurred during evening hours starting from 3.00pm, 4.00pm and 5.00pm that the amount of shading area casted on house facade in the Case Study 1 was 43%, 27% and 13% respectively in contrast to that of the Case Study 2 with only 27%, 17% and 9% respectively.

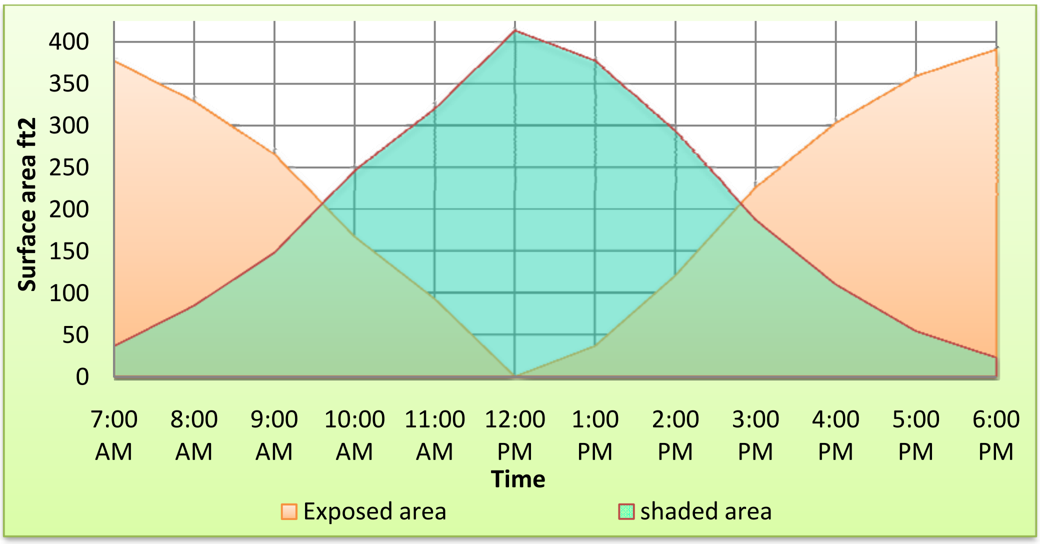

Figure 8: Shaded and exposed area on the house façade.

The results of shading area on house facade (Figure 8) in both case studies show that due to low angle of the sun in the sky at early morning and late evening (Chel, Tiwari and Singh, 2009; Hassan and Arab, 2013), the amount of shading areas accumulated on both house facades in the Case Study 1 and 2 were low (less than 30%) before 8.30am and after 4.00pm. The amount of shading area was smaller than the exposed areas from 7.00am to 9.30am and from 2.45pm to 6.00pm. The shaded areas had however increased gradually due to the increasing vertical sun angle. The results show that from 9.45am to 2.45pm, the amount of shading areas were larger than exposed area. The amount of exposed and shading area was equal at 9.45am and 2.45pm.

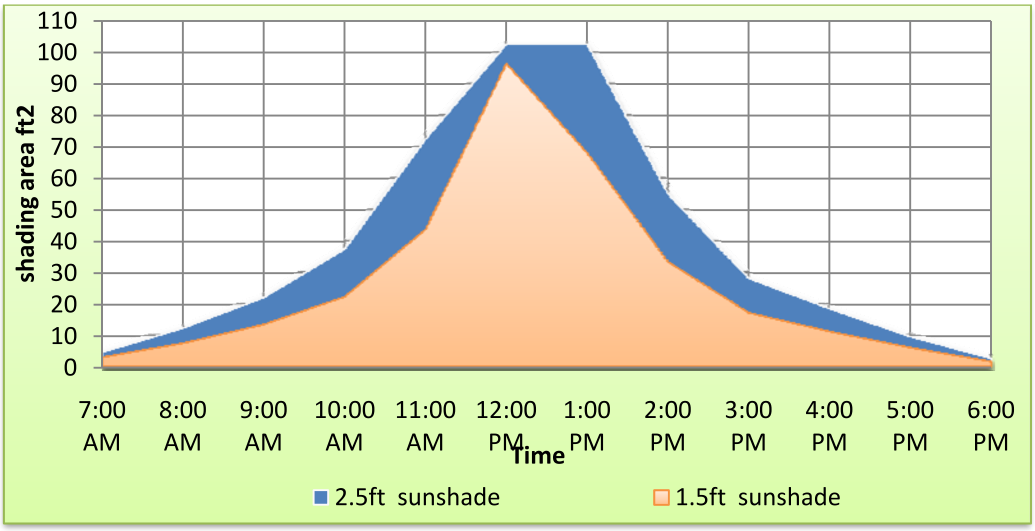

Figure 9: Shading area between 2.5ft and 1.5ft projection on the house facades.

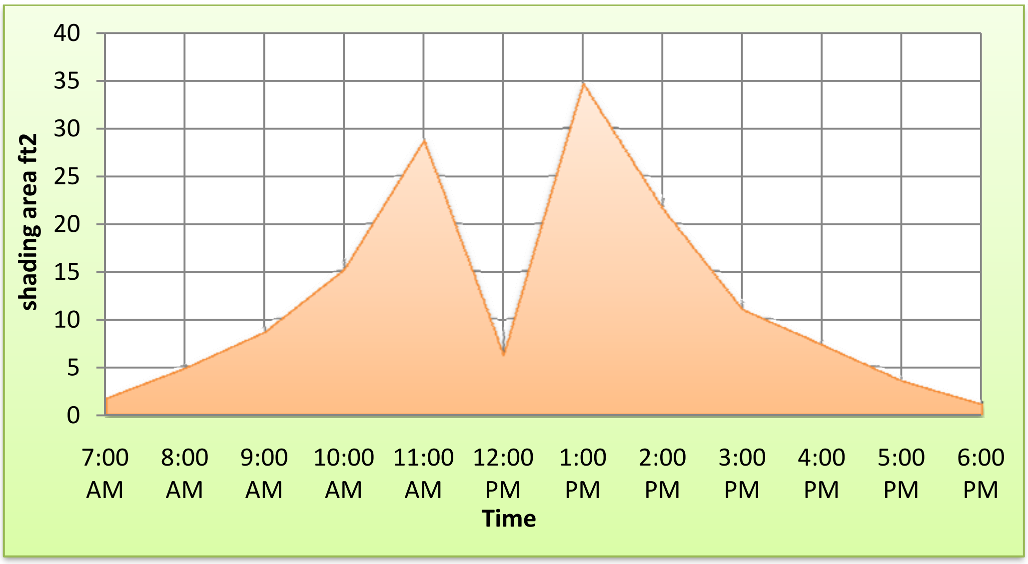

Figure 10: Difference of shading area between 2.5ft and 1.5ft projection.

The house facades were completely under shade at 12.00pm. Comparison of shading performance was also carried out between two types of sunshade projection which were built above the ground floor level of the Case Study 1 with 2.5ft and Case Study 2 with 1.5ft projection (Figure 9 and 10). It can be noted that there were a significant effect to the shaded areas where 2.5ft overhang projection provided larger shaded area than 1.5ft projection. The average difference was 12ft^2. The maximum difference was 34.64ft^2 recorded at 1.00pm while the minimum difference was 1.02ft^2 recorded at 6.00pm. The study found that the house facades built in 1950s only had roof overhangs working as horizontal projection's shading device, and no vertical projection's louver for sunshade purpose is used in the terraced façade design. Without the vertical louvers, the façade were exposed to low angle sunlight during evening hours.

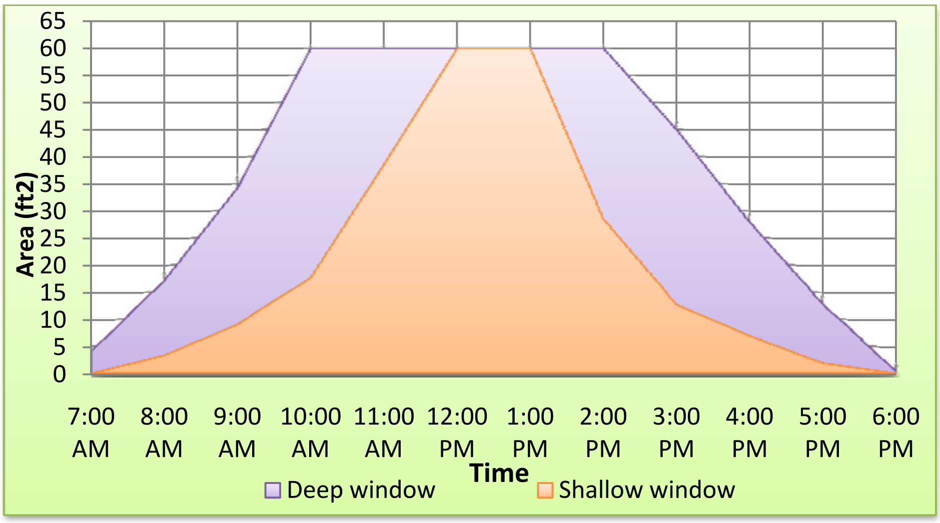

Figure 11: Shading performances on recessed (deep) and non-recessed (shallow) window

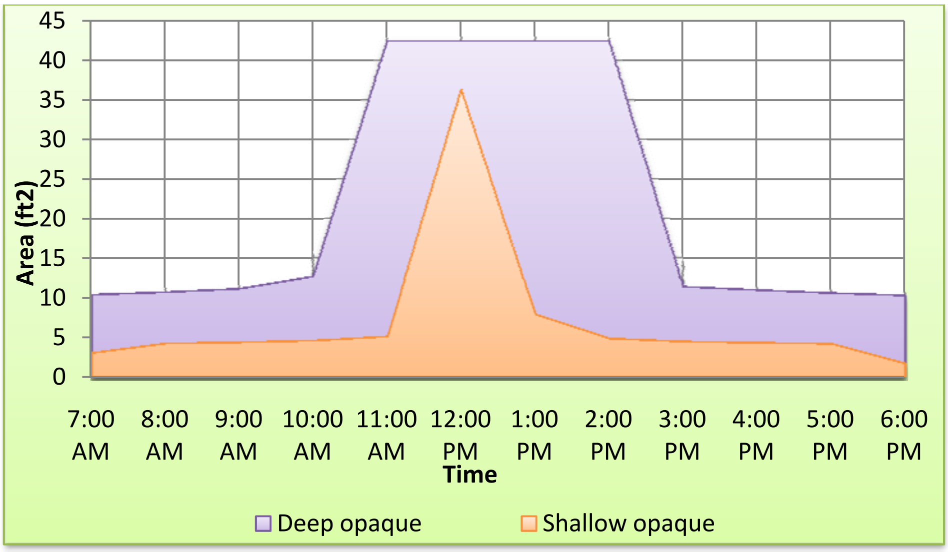

Figure 12: Shading performances between recessed (deep) and non-recessed (shallow) opaque wall.

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In addition, comparison of shading performance was carried out between 3ft recessed (deep window) and non-recessed window (shallow window) of the house facades. The result (Figure 11) indicates that the amount of shading area on recessed window was larger than non-recessed one. The recessed window was fully shaded starting from 10.00am to 2.00pm while non-recessed window was fully shaded from 12.00pm to 1.00pm. The average shading difference between them was about 20.3ft^2.

The same condition occurred on recessed and non-recessed wall surface. Figure 12 shows that the recessed opaque wall surface recorded with larger amount of shading area than non-recessed wall surface. The recessed wall was fully shaded from 11.00am to 2.00pm in contrast to non-recessed wall having full shade at 12.00pm. The average difference was about 14.45ft^2. The maximum difference was 37.68ft^2 recorded at 2.00pm while minimum difference was 7.38ft^2 recorded at 7.00am. Both the Case Study 1 and 2 had larger shading area at the first floor than the ground floor level. The reason is the Case Study 1 had recessed wall at its first floor level and the Case Study 2 had shorter overhang projection with only 1.5ft for its ground floor level. In summary, the result shows that the amount of shading area was relatively small with an average of 35% at 3.00pm, 22% at 4.00pm and 11% at 5.00pm in the Case Study 1 and 2. Having sufficient sunshades from 3.00 to 6.00pm is necessary because the evening duration has the warmest air temperature and direct sunlight penetration. In addition, the analysis found that the sky position of the sun plays an important role in creating the amount of shading area as noted by Djamila, Ming and Kumaresan (2011) on the house facade that the larger is the sun angle, the larger is the amount of shading area.

Small amount of the shading area on the house facade at early morning and late afternoon was due to low vertical angle of the sun. The shading area had however a gradual increase due to an increase of vertical angle of the sun (hourly movement of the sun) until it reach to 100% shaded at the afternoon. Due to this reason, the average difference of shading area was small from 7.00am to 10.00am and from 1.00pm to 3.00pm, while it had large average difference from 10.00 am to 11.00am and from 1.00pm to 3.00pm. In case with two types of sunshade projection, the maximum difference of shading area was recorded at 1.00pm when the house facade with 2.5ft overhang projection was at full shade whereas the house facade with 1.5ft projection was partly shaded. On the other hand, the minimum difference was recorded at 6.00pm due to very low sun angle, which caused the overhang projection become ineffective.

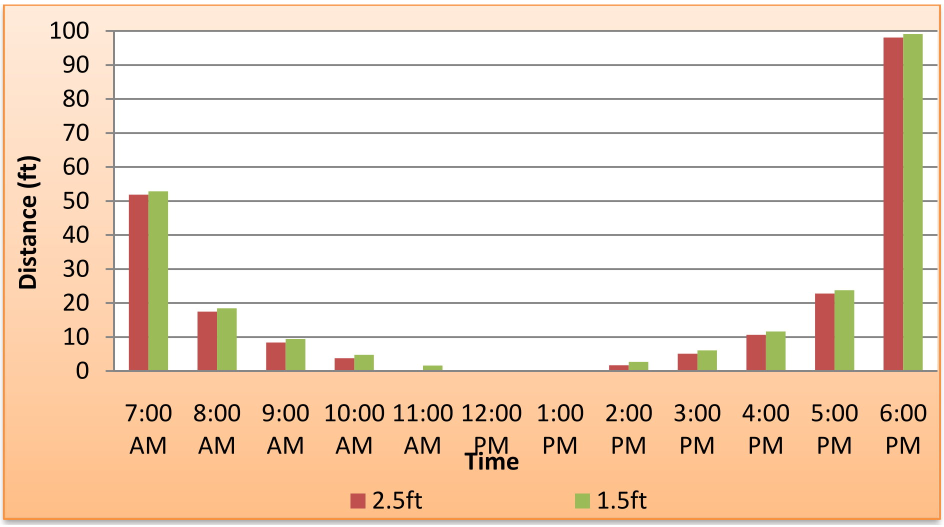

Figure 13: Extent of sunlight penetration between 2.5ft and 1.5ft projection.

The other analysis is the extent of sunlight penetration as illustrated in Figure 13. The extent of sun penetration is measured in feet, recording the distance of the sun penetration from the house facade to the indoor area. There were similar results on the extent of the sun penetration found in the analysis between Case Study 1 and 2 except the ground level which had longer sun penetration in its indoor area due to its short overhang with 1.5ft projection. The study also finds that the extent of sunlight penetration to indoor area through the house facades was another aspect which was influenced by the vertical angle of the sun position in the sky (Hassan and Arab, 2012). The sunlight started with deep penetration to indoor area from the house facade at early morning due to low angle of the morning sunlight. However, it retreated gradually until no penetration inside the house starting from 11.00am to 1.30pm. From 2.00pm to 5.00pm, it started penetration again with gradual increase and lastly at 6.00pm, it penetrated at the deepest extent to the indoor area. The average difference of the extent of sunlight penetration from 8.00am to 11.00am is about 8ft, ranging from maximum 1.6ft to minimum 18.4ft. While the average difference from 2.00pm to 5.00pm is about 10.55ft, ranging from minimum 1.69ft to maximum 23.8ft. The maximum extent was at 7.00am and 6.00pm which was about 52.8ft and 99.1ft respectively whereas the minimum extent was 1.6ft at 11.00am and 2.00pm. The result also shows that there was no sunlight penetration at afternoon when the vertical sun angle was at 90°. The sunlight penetration was influenced by sunshade projection. From the comparison between ground floor's (1.5ft) and first floor's (2.5ft) sunshade projection, it can be noted that the difference recorded in the extent of sunlight penetration was equal to the difference in the depth of shading projection.

5. Conclusion

The study concludes that terraced house facades built in 1950s do not efficiently design to tackle the facade exposure to direct sunlight. The study finds that the emphasis of facade design built in 1950s is more on the architectural style influenced by simple cottage design from Garden City movement in England rather than working on efficient shading devices to tackle direct sunlight penetrating to the facade wall and windows. Roof overhang and recessed wall with balcony are the horizontal shading elements commonly used in the house façade design. However these shading design elements were only able to provide less than 50% shading area especially to tackle evening sunlight from 3.00pm to 5.00pm on the house façade. No vertical shading device was commonly applied to the façade design during 1950s. Therefore, having excellent designs of recessed walls, vertical louvers and overhang projections working as sun shading devices are important in the house facade design to tackle the problem.

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7. References

Arab, Y. and A.S., Hassan. (2012). Daylighting Analysis of Pedentive Dome's Mosque Design during Summer Solstice with Case Studies in Istanbul, Turkey. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 3(2), 167-183.

Bakhlah, M.S. and A.S., Hassan. (2012). The Study of Air Temperature When the Sun Path Direction to Ka'abah: with a Case Study of Al-Malik Khalid Mosque, Malaysia. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 3(2), 185-202.

Barnett, J. (1987). *The Elusive City*, London: The Herbert Press.

Chel, A., G.N. Tiwari and H.N. Singh. (2009). A Modified Model for Estimation of Daylight Factor for Skylight Integrated with Dome Roof Structure of Mud-House in New Delhi (India). *Applied Energy*, 87, 3037-3050.

Department of Statistics Malaysia. (2003). *Characteristics of Living Quarters*, Putrajaya: Department of Statistics Malaysia.

Djamila, H., C. C. Ming and S. Kumaresan. (2011). Estimation of Exterior Vertical Daylight for the Humid Tropic of Kota Kinabalu City in East Malaysia. *Renewable Energy*, 36**,** 9-15.

Hall, P. (1988). *Cities of Tomorrow*, Oxford: Basil Blackwell.

Hassan, A.S. (2001). *Issues in Sustainable Development of Architecture in Malaysia*, Penang: USM Press.

Hassan, A.S. (2005) *Konsep Rekabentuk Bandar di Semenanjung Malaysia: Kuala Lumpur dan Bandar-Bandar di Sekitarnya*, Penang: USM Press.

Hassan, A.S. (2009a). The British Colonial 'Divide and Rule' Concept in Inner City of George Town, Penang: Its Influence to Irregular Layout of the Transport Access. *International Journal of Transportation*, 36(3), 309-324.

Hassan, A.S. (2009b). Sustainable Construction Issues of the Built Environment. *Contextual Issues of the Built Environment in Malaysia*, Hassan, Ahmad Sanusi (Eds.), Penang: USM Press. 1-15.

Hassan, A.S. and M. Ramli. (2010). Natural Ventilation of Indoor Air Temperature: A Case Study of the Traditional Malay House in Penang, *American Journal of Engineering and Applied Sciences*, 3(3), 521-528.

Hassan, A.S. and Y. Arab. (2012). Lighting Analysis of Single Pendentive Dome Mosque Design in Sarajevo and Istanbul during Summer Solstice. *The Arab World Geographer*, 15(2), 163-179.

Hassan, A.S. and S.R. Che Yahaya. (2012). *Architecture and Heritage Buildings in George Town, Penang*, Penang: USM Press.

Hassan, A.S. and Y. Arab. (2013). The Essence of Design with Light: Single Pedentive Dome Mosque in Turkey and Bosnia Herzegovina during Winter Solstice, *From Anatolia to Bosnia: Perspectives on Pedentive Dome Mosque Architecture*, Hassan, Ahmad Sanusi & Omer, Spahic (Eds.), Penang: USM Press.

Landry, M. and P. Breton. (2009). *Daylight Simulation in Autodesk 3ds Max Design 2009 - Advanced Concepts.* Denver: Autodesk Inc.

Mazloomi, M., A.S., Hassan, P.N. Bagherpour and M.R. Ismail. (2010). Influence of Geometry and Orientation on Flank Insolation of Streets in an Arid Climate City. *American Journal of Engineering and Applied* Sciences, 3(3): 540-544.

Shahriar, A.N.M. and M.A. Mohit. (2006). Frequency Distribution of CIE Standard General Skies for Subang, Malaysia. *Architectural Science Review*, 4, 363-366.

Zain-Ahmed, A. (2000). *Daylighting and Shading for Thermal Comfort in Malaysian*

Buildings, Hertfordshire: Department of Engineering, University of Hertfordshire.

Zain-Ahmed, A., K. Sopian, Z.Z. Abidin and M.Y.H. Othman. (2002). The availability of daylight from tropical skies a case study of Malaysia. *Renewable Energy*, 25, 21-30.

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Multiplication New Shoots from Embryo Culture on *Globba* spp.

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ABSTRACT

An in vitro propagation system was developed for comparison of six varieties of young *globba* embryos cultured on MS medium supplemented with various concentrations of BA. The result showed non significance Duncan's multiple range tests. The G-75, G-52, G-08 and commercial white varieties, cultured on MS medium supplemented with 5 mg/l BA, gave the highest average number of new shoots.

1. Introduction

Globba species belongs to the family Zingiberaceae and distributed throughout tropical (and parts of subtropical) Asia, ranging from India to southern China, south and east to the Philippines and New Guinea (Smith, 1988 and Boyce, 2006), with the center of distribution in monsoonal Southeast Asia, especially Thailand and Myanmar. Virtually all species distributed north of the Isthmus of Kra (most species of *Globba* and all species of the remaining genera). The other three genera of Globbeae are more restricted in distribution and fall completely within the range of *Globba* itself. Gagnepainia is found primarily in Thailand,

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Laos, Vietnam, and Cambodia, while Hemiorchis and Mantisia are distributed in northeastern India, Myanmar, and Bangladesh. (Seliger and Mc Elroy, 1995).

Flowers in the Globbeae, like all Zingiberaceae, are among the most highly derived in angiosperms (Endress, 1994; Kress et al., 2012). This species produced fantastic pendulous bracts with delicate white, yellow and orange inflorescences on the top of the leafy shoot. Calyces in the Globbeae are highly reduced, with petals replacing most of their protective function. Standard petal function (i.e., pollinator attraction and mechanical assistance to pollination) has been co-opted by elaborate staminodes that have replaced four of the six stamens that were fertile in ancestral species of Zingiberales (the fifth stamen is aborted in the Zingiberaceae and the sixth remains fertile; Kirchoff, 1988). *Globba* flowers are distinctive in having a relatively small staminodal labellum and a greatly elongated, arched stamen that is as long or longer than the floral tube and staminodes. However, the hallmark of most (90%) *Globba* species are the small linear to triangular appendages along the sides of the anther. The colorful bracts and flowers seen in many species are useful taxonomically and have attracted horticultural interest, especially for *G. winitii* C. H. Wright. Most, if not all, species of *Globba* can reproduce through the production of asexual vegetative bulbils in the inflorescence, a rare occurrence in the rest of the family (Larsen *et al*., 1998).

Also, trimming the seed coat to break dormancy followed by micropropagation can yield a large number of plantlets within a short period (Chanchula *et al*., 2013).

The objectives of this research were to find suitable methods for micropropagation young *Globba winitii*. During the embryos of seed, embryos were often cut and destruction from equipment. Culturing them to increase the percentage of germination and obtain rapid shoot emergence in a short period, and to find the most suitable concentration of BA for increasing the number of new shoots in 6 varieties of globba by using embryo culture.

2. Materials and Methods

For this experiment, selecting the best trimmed of seed for embryo cultures 6 varieties of *globb*a (Khao Burma was *G. magnifica*, G-75 was *G. winitii* “Rubby Queen”, G-52 was *G. schumberkii* “Burmese Dancing Girl”, G-03 was *G. winitii* “Purest Angel”, G-08 was *G. winitii* “Pristina pink” and Commercial white was *G. winitii* “White Dragon”) cultured on

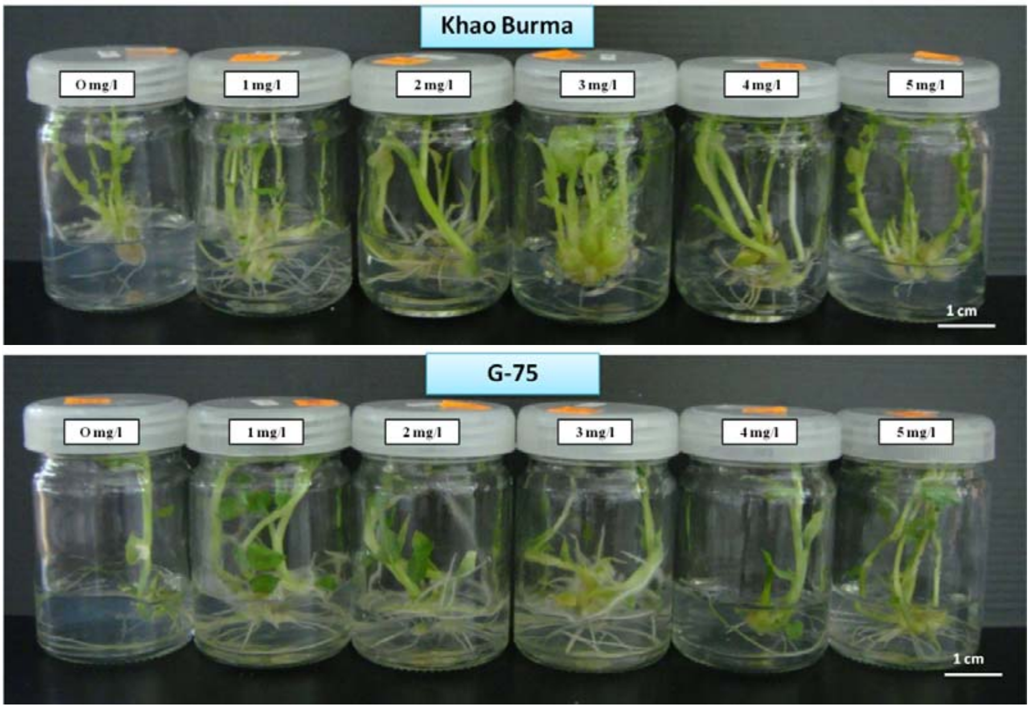
Murashige and Skoog (MS,1962) medium. After all seeds germinated, the embryos were transferred to MS medium supplemented with various concentrations of BA (0, 1, 2, 3, 4 and 5 mg/l) to stimulate new shoot formation and and subcultured at 2 weeks intervals for further growth to the same medium for total 4 times. Data were collected on the number of plantlets.

3. Statistical analysis

Experiments were set up in Completely Randomized Design (CRD) with 6 treatments; each treatment consisted of 25 replicates for this experiment. The test of statistical significance was done by applying Duncan's Multiple Range Test (DMRT) at 5% confidence level using SAS statistical software, Release 6.03 (SAS Institute Inc., Cary, NC).

4. Results and Discussion

After cultured embryos of 6 varieties of Globba spp. on MS medium supplemented with various concentration of BA (0, 1, 2, 3, 4 and 5 mg/l) for 6 weeks. The result is discussed below.



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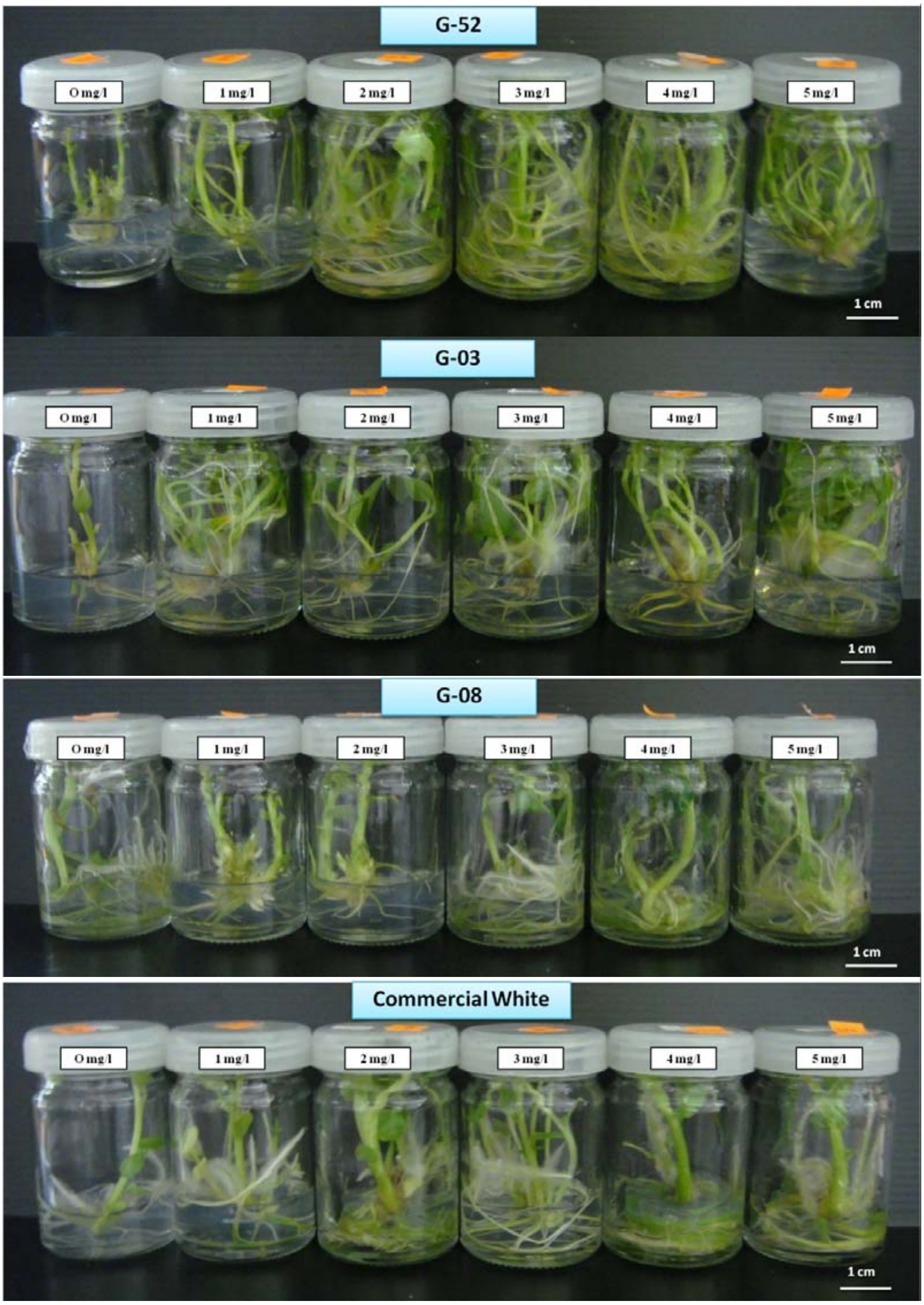

Figure 1: Number of new shoots from each varieties of *Globba* sp. cultured on MS medium containing different concentrations (0, 1, 2, 3, 4, 5 mg/l) of BA after 6 weeks of culture.

4.1 Shoot Induction

The number of new shoots tips emerging from embryos of 6 varieties of globba after transfer to MS medium supplemented with different concentrations of BA (0–5 mg/l) for 60 days are shown in Table 1. The number of new shoots formed from direct somatic embryo in each concentration of BA were not significantly different. However, in this experiment, different varieties of *globba* responded differently to different concentrations of BA. For instance, Khao Burma cultured on MS medium supplemented with 2 mg/l BA gave the highest number of new shoots (Figure 1A). This result was different from the other varieties. *Globba* (G) varieties number 08, 52, 75 and commercial white which gave a higher number of new shoots when cultured on MS medium supplemented with 5 mg/l BA (Figure 1B, 1C, 1D). In contrast, young shoots of variety G-03 responded best to 1 mg/l BA and gave the highest number of new shoots (4.00 shoots) on that medium (Figure 1E). This result is compatible with the findings of Jala (2011), who reported that *Globba winitii* (white bract) gave the highest number of new shoots when cultured on MS medium supplemented with 2 mg/l BA, and another report by Jala (2012), in which the highest number of new shoots of *Nepenthes mirabilis* was obtained when the plants were cultured on MS medium supplemented with 2 mg/l BA.

Table 1: Number of new shoots from young embryos which were cultured on MS medium containing different concentrations of BA after 8 weeks of culture.

Globba varieties	Number of new shoots at different concentration of BA (mg/l) ^{NS}					
	0	1.00	2.00	3.00	4.00	5.00
Khao Burma	1.00±00	3.00±1.00	4.33±3.21	3.66±1.15	3.66±2.08	4.00±1.00
G-75	2.33±0.57	1.66±0.57	2.33±0.57	2.33±0.57	3.33±0.57	8.66±2.08
G-52	1.33±0.57	3.00±1.00	1.66±0.57	2.33±1.00	2.00±1.00	5.33±1.15
G-08	1.66±0.57	1.33±0.57	4.33±1.5	2.33±0.57	1.33±0.57	5.33±0.57
G-03	1.66±0.57	4.00±1.11	2.00±0.00	1.00±0.00	1.33±0.57	1.66±0.57
Commercial white	1.66±0.57	3.00±0.00	2.00±1.00	3.00±1.00	3.00±0.00	5.33±0.57

(Average mean ± SD)
NS – non significant different among treatments.
Descriptive Statistic Significance level 0.05

5. Discussion

For induction of multiple shoots via direct organogenesis, induction of multiple shoots through shoot-tip culture was initiated on MS medium supplemented with different concentration BA. Thus, growth of shoot tips and subsequent multiplication could not be achieved in medium without PGR as reported earlier (Rout et al., 2000). All treatments which incorporated with BA were able to induce multiple shoots and spontaneous root. As Kho *et al*. (2010) reported in vitro propagation of *Globba brachyanthera* by culturing on Gamborg B5 medium supplemented with 3.0 mg/L BAP and get the highest multiplication rate of 6.6

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shoots per explants. Jala (2011) had done with Curcuma longa and used 2mg/l BA gave 2.6 shoots per explants. As Shukla et al.(2007) had done with *Curcuma angustifolia* Rozbi which used 3 mg/l BAP could produced 6.9 shoots per explants within 6 weeks. In *Zingiber officinale* Rosc. which related family to turmeric, was reported by Balachandran *et al* (1990). All treatments which incorporated with PGR were able to induce multiple shoots and spontaneous root has been reported earlier for a few species of Zingiberaceae (Balachandran *et al*., 1990; Borthakur *et al*., 1992; Kuruvinashetty *et al*., 1982).

6. Conclusion

Young embryos could be induced to germinate by trimming the young seeds. However, there is no significant difference on mean number of shoots induced from *globba* varieties cultured on MS medium supplemented with various BA concentrations. Nevertheless, Khao Burma cultured on MS medium incorporated with 2 mg/l BA gave the highest average multiplication rate of new shoots at 4.33 shoots, while varieties G-75, G-52, G-08 and commercial white cultured on MS medium supplemented with 5 mg/l BA gave the highest average number of new shoots at 8.66, 5.33, 5.33, and 5.33 shoots, respectively.

7. References

Balachandran, S.M., Bhat, S.R. and Chandel, K.P.S. (1990). In vitro clonal multiplication of turmeric (*Curcuma* spp) and ginger (*Zingiber officinale* Rosc). Plant Cell Reports. 8: 521-524.

Borthakur, M., Hazarika, J., and Singh, R.S. (1999). A protocol for micropropagation of Alpinia galanga. Plant Cell, Tissue and Organ Culture. 55: 231-233.

Boyce, P. (2006). The Gingers of Sarawak III - The Miniatures. Bulletin of the Helliconia Society International. 11(3): 1-4.

Chanchula N, A. Jala, and T. Taychasinpitak. 2013. Break Dormancy by Trimming Immature *Globba* spp. INT TRANS J ENG MANAG SCI TECH, 4(3): 171-178.

Endress, P. K. (1994) Diversity and evolutionary biology of tropical flowers. Cambridge University Press, New York, New York, USA.

Jala, A. (2011) Role of BA and NAA on callus and shoot induction of *Globba winitii* L., The 10th National Horticultural Congress 2011. May 18-20, 2011. At Miracle Grand Hotel. Bangkok, Thailand.

Jala, A. (2011) Effects of NAA BA and Sucrose On Shoot Induction and Rapid Micropropagation by Trimming Shoot Of Curcuma Longa L. American Transactions on Engineering & Applied Sciences, 3(2): 101 -109.

Jala, A. (2012) Type of media for seed germination and effect of BA on mass propagation of *Nepenthes mirabilis* Druce., American Transactions on Engineering & Applied Sciences, 1: (2) : 163 -171.

Kirchoff, B. K. (1988) Floral ontogeny and evolution in the ginger group of the Zingiberales. In P. Leins, S. C. Tucker, and P. K. Endress [eds.], Aspects of floral development. S tuttgart Press, Berlin, Germany.

Kress, W. J., V. Gowda, and T. Htun. (2012)Two new species of Gingers (Zingiberaceae) from Myanmar. PhytoKeys 13: 5–14 .

Kuruvinashetty, M.S., Haridasan, P. and Iyer, R.D. (1982) Tissue culture studies in turmeric (*Curcuma longa* L.). In: MK Nair et al., (Eds.) Proc. Nalt. Seminar on ginger and Turmeric. pp. 39-41. CPCRI Kasaragad, Kerala.

Kho, P. E. 1, H. B. Sani, P. C. Boyce, S. L. Sim. (2010). In Vitro Propagation of *Globba brachyanthera* K.Schum. AsPac J. Mol. Biol. Biotechnol. Vol. 18 (1) : 119-122.

Larsen, K., J. M. Lock, H. Mass, and P. J. M. Maas. (1998) Zingiberaceae. In K. Kubitzki [ed.], The families and genera of vascular plants, vol. IV, 474–495. Springer-Verlag, Berlin, Germany.

Murashige T. and Skoog, F. (1962) A revised medium for rapid growth and bio-assays with tobacco tissue culture, Physiology Plant, 15: 473-474.

Rout, G.R., Palai, S.K., Samantaray, S. and Das, P. (2001). Effect of regulator and culture conditions on shoot multiplication and rhizome formation in ginger (*Zingiber officinale* Rosc.) in vitro. In Vitro Cellular & Developmental Biology-Plant. 37: 814-819.

Smith, R.M. (1988). A Review of Bornean Zingiberaceae: IV (Globbeae). Notes from the Royal Botanic Garden Edinburgh 45(1): 1-19.

SAS Institute (1990) SAS/STAT User's Guide. Release 6.03. 2000, SAAS Institute Inc., Cary, NC, USA.

Seliger, H.H., and Mc Elroy, W.D. (1995) Temperature and Plant Development, Pp.407-419. Introduction to Plant Physiology, John Wiley & Sons, Inc., New York.

Shukla, S.K., S. Shukla. V.koche and S.K. Mishra. 2007. In vitro propagation of tikhur (*Curcuma angustifolia* Roxb): A starch yielding plant. Indian Journal of

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Observation on College Steel Bridge Truss Models Thailand Eighth Contest and Thammasat University Team Bridge Model Design Concept

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ABSTRACT

This work presents the processes, scoring system, and observation of the Thailand's College Steel Bridge Truss Models 2011 Contest. For Thammasat University (TU) Bridge Design team model, we applied the load and resistance factor design (*LRFD*) of bridges [1], [2]. Prior, the *AASHTO LRFD* Bridge Code was reviewed which included investigation into the design code's background documentation [3].

For this contest, the bridge models must be the steel bridge truss structures with span lengths 5 meters. All structural members must be the rolled-steel shape members.

The scoring system for the contest is comprised of four categories: 1) Construction Speed Score, 2) Economy Score which is consisted with two parts that are the labor and material costs, 3) Structural Stiffness Score, and 4) Structural Efficiency. Types of truss failures have been observed.

1. Introduction

For the engineering education in Thailand, the college steel bridges contest has contributed to the structural engineering education and the relationship between the structural engineering schools in Thailand. This contest includes several activities such as the steel

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bridges construction, steel bridges strength testing, and steel bridge design presentations. This work observes the Eighth Thailand Steel Bridge Competition (2011 Contest), hosted by Sripatum University, Thailand.

Figure 1: Bridge Structure Members (Rolled-Steel Shape Cross Section Types).

2. Contest Rules

The contest rules are as followed.

Structural Materials and Bridge Installation

- Material

There are some limitations and specifications on the construction materials and structure installations as the follows:

1. All of bridge structure members must be steel but can use some cable as the tension member in structure.
2. All members must be the rolled-steel shape member and only Rectangular/Square box, Equal Angle, Unequal Angle, Channel, or Light Lip Channel cross sections have been allowed to use as shown in Figure 1.

Figure 2: Bridge Structure Joints

Figure 3: Bridge structures before construction.

3. All structural joints must to connect the members by bolt and nut only; the welding is prohibited as shown in Figure 2.
4. The printing is allowed but all types of the treatment covering for increasing the material strength is prohibited as shown in Figure 3.

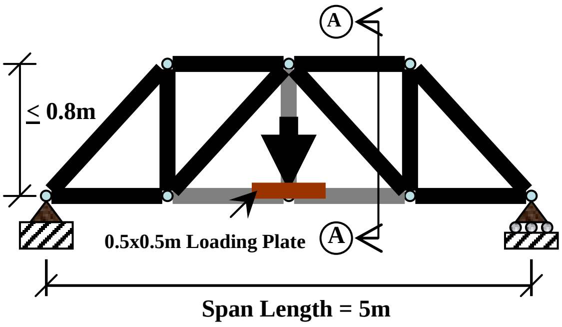

Figure 4: Typical of Bridge Structure

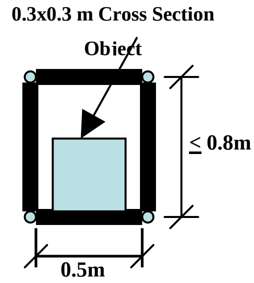

Figure 5: Section (A)-(A).

- Bridge Structure Specifications

The bridge structures must be the determinate structures and constructed under some construction specifications as the follows:

The bridge structure must be the simple span or one span structure and has the span length equal 5.0 m. that will be measured from the center to center of each support as shown in Figure 4.

1. The total height of structure is not more than 0.8 m. from the outer bottom edge to outer top edge as shown in Figure 4.
2. The total width of structure is not more than 0.5 m. from the inner edge to edge as shown in Figure 5.
3. Not allow to have any parts of the bridge structure to get below the support more than 0.1 m
4. The bridge structure must design by using the fundamental of truss structure theory.
5. Inside of the bridge structure must have space enough for a 0.3x0.3 m object can pass through as shown in Figure 5.
6. The total weight of structure is not more than 70 kg.
7. The steel structure must be installed perfectly and properly on the testing structural loading system which will be used to load on the competition structures.
8. All structural members must have their lengths not more than 1.7 m. (including the cables)

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9. Not allow to connect any parts of structure before the contest.
10. In the mid span of bridge structure, it must have a 0.5x0.5m space area for installation the loading plate as shown in Figures 4, 6, 7, and 8.

Figure 6: Loading Plate Installation

Figure 7: Bridge Structure Loading (1)

Figure 8: Bridge Structure Loading (2)

Figure 9: Preparation and Storage Area (7.0x2.3 m)

Bridge Structure Assembly and Installation

The bridge structures must be constructed by having the following limitations:

1. Before the assembling step, all teams have only a 7.0x2.3 m area for preparation and storage all equipment and structural members as shown in Figure 9.

2. Limitation of the team members not more than 8 peoples.
3. Time limit is 120 minutes, if any team uses the construction time more than 120 minutes then it will be disqualified from the competition.

Structural Strength Conditions

The bridge must be loaded at least 1,000 kg that will be slowly applied at the mid span as shown in Figure 4 and maximum defection of the bridge structure when carrying the 1,000 kg load is not more than 5.0 cm. The loading system is consisted with Hydraulic jack, load cell, dial gages and data logger. Each team must pass the strength limitation (1,000 kg. loading and 5.0 cm defection) before considering others properties and behaviors. For the failure point, it means the rupture or failing any parts of structure or has too much deformation or deflection when compared with the normal bridge structure or bridge design code.

Scoring System

The scoring has been set as the following:

1. Construction Speed 25 points
2. Economy 25 points
3. Structural Stiffness 25 points
4. Structural Efficiency 25 points

- Construction Speed Score (25 points)

The construction speed (*CT*) score will be considered by collecting the construction time in minutes from start to finish but not more than 120 minutes. The committee will calculate the scores by considering the fastest team and slowest team construction times and then calculate the *CT* score by using Equation (1)

$$CT\_Score = 25 - (20)\left[\frac{CT_i - CT_{\min}}{CT_{\max} - CT_{\min}}\right] \quad (1)$$

when CT_i is the construction time of each team

$CT_{\max}$ is the construction time of the slowest team (min.)

$CT_{\min}$ is the construction time of the fastest team (min.)

- Economy Score (25 points)

The economy score is comprised with two parts which are the labor (*LC*) and material (*MC*) costs. The *LC* cost can calculate by Equation (2).

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$$LC = N * T \quad (2)$$

when N is the number of construction people

T is the construction time

The MC cost can consider from the weight of whole bridge structure in kg and the economy score is calculated by Equation (3).

$$Economy\_Score = \left[10-(5)\left(\frac{LC_i - LC_{\min}}{LC_{\max} - LC_{\min}}\right)\right] + \left[15-(10)\left(\frac{MC_i - MC_{\min}}{MC_{\max} - MC_{\min}}\right)\right] \quad (3)$$

when LC_i is the LC cost of each team

$LC_{\max}$ is the maximum LC cost

$LC_{\min}$ is the minimum LC cost

MC_i is the MC cost of each team

$MC_{\max}$ is the maximum MC cost

$MC_{\min}$ is the minimum MC cost

- Structural Stiffness Score (25 scores)

The resistant of structure is called as the structural stiffness. It is a structural property that resists the structural deformation and it can be calculated from the relationship between loads and vertical deformations at mid span in the case of bridge structure. For this contest, we assume that the bridge structure has the linear elastic behavior. The maximum stiffness (team) score (*Stiff* max) will be 25 points and the minimum stiffness score (*Stiff* min) will be 5 points. Then, the stiffness score for each team can be calculated from Equation (4).

$$Stiffness\_Score = 25-(20)\left(\frac{Stiff\ \max - Stiffx}{Stiff\ \max - Stiff\ \min}\right) \quad (4)$$

While, the stiffness of each team (*Stiffx*) is calculated by Equation (5).

$$Stiffx = \frac{\Delta_{load}}{y_{1000} - y_{500}} \text{, unit: (kg/mm)} \quad (5)$$

when Δ_{load} is the different between 1000 kg and 500 kg which is 500 kg

y_{1000} is the vertical defection in mm. at the load equals 1000 kg

y_{500} is the vertical defection in mm. at the load equals 500 kg

Stiff max is the maximum stiffness value

Stiff min is the minimum stiffness value

- Structural Efficiency (*SE*) Score (25 points)

The efficiency of bridge structure can be calculated from the multiplication between the material volume and the mid span vertical defection at 1000 kg loading as Equation (6).

$$SE_i = MC * y_{1000} \tag{6}$$

When, the small value of *SE* means the rather good efficiency, from this meaning, the minimum *SE* team will get the maximum score that is 25 points and the maximum *SE* team will get the minimum score that is 5 points as well. The each team *SE* score can be calculated from Equation (7).

$$SE\_Score = 25 - (20)\left(\frac{SE_i - SE_{\min}}{SE_{\min} - SE_{\min}}\right) \tag{7}$$

when SE_i is the structural efficiency of each team

y_{1000} is the vertical defection in mm. at the load equals 1000 kg

$SE_{\max}$ is the maximum *SE* value

$SE_{\min}$ is the minimum *SE* value

Total Score

For the total score, it can be calculated by accumulating all parts of score as shown in Equation (8)

$$Total\_Score = CT\_Score + Economy\_Score + Stiffness\_Score + SE\_Score \tag{8}$$

3. Thammasat University (TU) Bridge Design: Design Concepts and Teamwork

For "TU Bridge Design" team, the steel bridge model has been designed by Load and Resistant Factors Design (*LRFD*) [1], [2] that based on the reliability based design [3], [4]. For this design method, it has followed the *AASHTO LRFD* Design specifications.

In the design process, the two limit state functions have been created that are the tension limit state function and compression limit state function. And then the reliability index has been selected that is 3.5 [4] for both the tension and compression members. In this process, the load combination and load and resistance factors have been properly selected [3], [4]. By

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this design method, the TU Bridge Design team model is the Pratt Arch truss and all members are the 2.5x2.5 mm angle cross-section. The 2 mm thickness steel plates (gusset plate) are used in the truss joints and only one bolt is used to connect between the joint (plate) and truss member in order to control the total weight and construction time of the model as shown in Figures 10 and 11.

Figure 10: Bridge Structure Joints: TU Bridge Design Team

Figure 11: TU Bridge Design Team and Model

There are eight students in TU Bridge Design. The group is separated into two subgroups, the build & installation and preparation groups. The build & installation subgroup consisted of five students, with mission both preparation the bridge model and building the model during competition time. The preparation subgroup included three students.

4. Results and Discussions

From the steel bridge model contest, there are many types of bridge failure. Figures 12 and 13 show the bridge joint, member, and support failure, respectively. Figures 14, 15, 16, and 17 show the various bridge structure failures such as side sway, side-sway combined with vertical buckling, structural (vertical) buckling, and lateral buckling respectively.

Figure 12: Joint Failure

Figure 13: Support Failure.

Figure 14: Side-sway of Bridge Structure

Figure 15: Side-sway with Vertical Buckling

Figure 16: Vertical Buckling

Figure 17: Lateral Buckling

For TU Bridge Design, its model is failed by the joint failure because a support is set at the member (near the end of member) not at the joint as shown in Figure 12 and the maximum defection of the model is about 4 cm. For this kind of failure, it can be eliminated and controlled by setting the supports exactly at the joints not at the members.

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5. Conclusion

From the steel bridge model contest, there are many kinds of bridge collapse such as the joint failure, member failure, whole structural failure, structural buckling, lateral buckling, support failure, etc.

From the competition and testing, the students could study, observe, and recognize the bridge behavior in real time. It creates the recognized knowledge, perfect learning, and useful experience as well.

6. Acknowledgement

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7. References

[1]. AASHTO (1996). "Standard Specifications for Highway Bridge Design" 16th Ed. 1996, Washington, DC., USA.

[2]. AASHTO (1998). "LRFD Bridge Design Specifications" 2nd Edition, 1998, Washington, DC., USA.

[3]. National Cooperative Highway Research Program Report (NCHRP) 368 (1994). "Calibration of LRFD Bridge Design Code" Transportation Research Board, National Research Council, Washington, DC., USA.

[4]. Barker, R. and Puckett, J. "Design of Highway Bridges" 1997, John Wiley & Sons, INC., New York, USA.

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Planning Model of Religious Cultural Heritage Buildings as a Concept to Intensify the Image of the Region

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ABSTRACT

The issue of heritage buildings is an important part in the development of a city. Historic buildings have high value tourism, if managed properly. Unfortunately, the government is less concerned about the presence of historic buildings. Urban development is more focused on commercial activities and generates high revenue for the region.

Many historic buildings in the city of Jakarta are not properly maintained. Several historic buildings that have religious values often lead to conflict. The buildings are supposed to have an atmosphere of worship and sacred environment, even more immersed in line with the development of the city.

This study is to identify the problems of the religious cultural heritage buildings in Jakarta that will be processed based on the Physical Components and Socio-Cultural Components. The result of the study is the mapping of potential problems and give solution about a model of cultural heritage buildings in the area, especially religious building. This model hopefully can solve the problem of disharmony between the religious value of cultural heritage buildings and its environment surrounding.

1. Introduction

The rapid development of Jakarta marked by the rising of modern buildings and diverse community activities has implications for the existence of religious cultural heritage buildings'

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value. The value and meaning of these building began to be ignored in a rapid environmental development and in the activities of a dynamic urban society. The essences of each religious buildings of cultural heritage value have meanings. Architectural old mosques show the glory of religion (Dijk, 2009:50), the symbol of faith and Islam (Azra, 2003:14) and churches emit majesty (Vletter, 2009:275). But the existence of most of the religious heritage buildings located in major cities including the cities of Jakarta, merely act as a silent witness of history without meaning.

The problem of religion is still a very sensitive issue in many countries including Indonesia. All things that offend the religious sphere could trigger conflict in society (Herlianto, 1997: 32-33), including issues where religious activities are performed such as in places of worship and tombs. Incident between masses and government instruments in the case of tombs '*Mbah Priok'* in *Koja*, North Jakarta, was triggered by the action of local government in the course of controlling environmental problems and surrounding of that holy tomb.

The research results of *Groote* and *Haartsen* revealed that the role of cultural heritage objects is as a form for the identity of place (2008: 182-190). The identity or characteristics of an area is very important for community life. A local loss of uniqueness or particularity of the specific character of cultural image of the local community and environment will form the appearance of a monotonous environment, not meaningful, and does not reflect the true identity of the society and the environment.

Psychologically, Eckardt (1967: 20) says that the loss of place identity will cause the loss of sense of identity to the environment and community life. Yet sense of identity to the place is one form that shaped the basic needs of existence of the man himself.

Furthermore, the research results of *Milgram* describes that if a sense of identity of a place gets thin, then society will feel something called anomie (situation without norms) and feel alienated. This situation is highly susceptible to the actions violating the norms, including acts of violence that happened in *Mbah Priok's* tombs. The incident caused a lot of material losses and casualties. It is a concrete example as well as a warning that necessary attention should be taken on the religious buildings of cultural heritage, especially the ones which relate to the environment and surrounding communities.

In his paper, titled ***the mosque as a reflection of Islamic civilization***, Professor of Islamic history and civilization, Azyumardi Azra (2003) said that the spatial arrangement of the mosque is an interesting subject.

The mosque is the focal point and the initial spatial arrangement of the Muslims living environment. From the mosque then developed other spatial units. The rapid development of architectural design and more intensive cultural exchanges between different regions of the Muslim world make architectural design Mosque in Indonesia increasingly having many choices.

However, the architecture of the mosque still need to give special attention since mosque is a place of worship, holy places, where every Muslim through acts of worship are held in mosques to be close to Allah SWT. Therefore, the architecture design of the mosque should encourage growth and improve the absorption and pilgrims' serenity, not only as a place of worship, but also as a neighborhood mosque as a whole (Azra, 2003: 14-15).

The existence of religious cultural heritage buildings and its environment that are mutually harmonious with the environment will shape the image of the region and will grow or increase community awareness and sense of belonging to protect and preserve objects of cultural heritage. Meaning and value that emanated from the religious buildings of cultural heritage value will establish the identity of the area which gives a positive influence to people's lives, especially the local community identity, as stated by Walmsley (1988): ***Place identity is, after all, a part of self-identity***.

The research results of Eagles *et al*. (2002) illustrate that countries in Europe, America, Africa and Asia which success in managed development of a heritage tourism begin with the settlement arrangement have develop potential of its protected areas.

The description above describes various problems and potentials associated with the importance of arrangement of the area of religious cultural heritage buildings. This paper is to present the arrangement model of religious cultural heritage buildings to preserve and enhance the image of the region.

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2. Literature Review

Until now, scientists have done many studies and researches with a topic on buildings, areas or sites of cultural heritage, for example: Kapel dan Kuil, Masjid dan Makam Bersejarah (Dijk, 2009; Heuken, 2003a; Sumalyo, 2006), Gereja (Heuken 2003b; Vletter, 2009), and Klenteng (Salmon and Lombard, 2003). These studies and researches deeply explored the history, anthropology and architecture of buildings or the areas of religious cultural heritage buildings. However, they did not examine specifically on the arrangement of religious cultural heritage buildings area.

Disharmony between the religious value of cultural heritage buildings and the surrounding environment is the subject matter of this research. This is indicated by the incompatible condition of the building and surrounding environment and the inharmonious relationship to the character of the heritage buildings. Results of research on improving the quality of housing in the *Betawi's* culture preservation area called *Setu Babakan* (Prawesthi *et al*., 2009) found that socio-cultural background of a heterogeneous society in the region affect the appearance of some buildings and environmental conditions that are not harmonious with the architectural features of *Betawi's* culture. There were influences of socio-cultural background diversity of buildings and environmental arrangement, in accordance with the research results Djajadi (1990: 88) in Jakarta, Yogyakarta and Medan.

With regard to the relationship between humans and place, Pocock and Hudson (1978: 81) asserts that a place will be influenced by human beings, such as the appearance of the house will display the personal identity of its inhabitants; cultural values of society will affect the environment. In contrast, humans will also be influenced by the place, as an example of human behavior will be very different according to place, for example at home, in places of worship, or at the train station.

Various literature states that the spaces between buildings act as the main component affecting the appearance of the city. In his book, creating a city identity, Goldsteen and Elliot (1994: ix) emphasized that the spaces between the buildings is a major element of urban settings.

The role of the spatial aspects as forming relationships, time stylists, stylists of an environment of community cultural values can indicate character traits and the environment as an identity. In other words, the arrangement of space reflects the character, patterns of life and purpose of life in an environment, the values of life, even cultural communities (Prasidha, 1999:7). Briggs (Pocock and Hudson, 1978: 80) suggests that a sense of place relates to the relationship between people and place, as something that aware the differences in character on certain areas (the distinctive character of specific localities).

Altman and Chemers (1984: 253-265) mentioned three characteristics that make up the identity of an urban area (urban identity process), namely: 1) order/disorder, 2) homogeneity/diversity, and 3) individuality/community. Image of the city can be structured through the city image elements, namely nodes, paths, districts, edges, and landmarks (Lynch, 1982: 47-48, and 1992: 135-147).

Rapoport (1977: 229-231) argues that each city or region has a noticeable differences as typical of each. The differences are divided into physical differences, social differences and temporal differences. The real things that distinguish one city or region with other cities are: 1) physical differences, including: visual, kinesthetic, sounds, smells, climatology, texture of outer space and road surface, 2) social differences, including: the condition of society, activities, allocation of activities, symbols and social status, and 3) temporal differences, including changes in society and daily activities.

In conservation program, sometimes we used overlapping terms. The classification of conservation terminology derived from the *Burra* Charter, an international charter on conservation and restoration (*Burra* Charter Revision of 1999) which consists of: preservation, conservation, restoration, rehabilitation, renovation, reconstruction, and adaptation.

In Indonesia, The Regulation of the Minister of Public Works No. 06/PRT/M/2007 about Guidelines for Building and Environment Planning, states eight urban design components, namely: 1) the structure of land use 2) the intensity of land use 3) the system of building 4) the system of circulation and connecting lines 5) systems and procedures of green open space 6) good quality of the environment 7) environmental and utility infrastructure systems and 8) building and environmental conservation. Those components of urban design is synergy to the eight elements of urban design process that was presented by Shirvani (1985) which consists of: 1) land use 2) building form and massing 3) circulation and parking 4) open space 5) pedestrian 6) support activity 7) signage and 8) preservation.

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Religious heritage buildings that are located in urban areas generally have a complex environmental problem than those that are located in specific areas which are set as heritage areas. This is because it involves heterogeneous socio-cultural aspects of the society and rapid physical development. Until 2007, there are four areas of cultural heritage in Jakarta, these are: the Old City area, *Menteng*, *Kebayoran Baru* and *Setu Babakan* (*Dinas Kebudayaan dan Permuseuman Provinsi DKI Jakarta, 2007:2*). Based on the complexity of these problems, the location of cultural heritage buildings in this study were in mixed areas, not in the area of cultural heritage that has been set by the government.

3. Objective of Study

The determination of the location of the study refers to the criteria of cultural heritage objects, *Undang-Undang Republik Indonesia No. 5 Tahun1992 Pasal 1.* It establishes the criteria of and meaning of cultural heritage objects which are:

a. Man-made objects, movable or immovable in the form of entity or group, or the parts or the rest of the rest, which was at least fifty years, or represent the unique style and represents the style of at least fifty years, and deemed to have important value for the history, science, and culture;
b. Natural objects which have significance for the history, science and culture.

Based on the data of DKI Jakarta Culture and Museum Department, there are 129 objects of cultural heritage and 4 islands spread in six regions of Jakarta Province. Referring to the age limits and criteria of cultural heritage objects above, there is no Hinduism heritage buildings (Temple) in the area of DKI Jakarta Province. So, religious heritage buildings observed only consists of mosque, church, monastery (pagoda), and the tomb.

Based on the criteria and the complexity of the problem, this research will focus on 4 areas of religious heritage buildings, which consists of mosque, church, monastery and tomb in the area of DKI Jakarta Province, namely:
a. Makam Pangeran Wiraguna (Figure 1a), South Jakarta (Thomb)
b. Gereja Koinonia (Figure 1b), East Jakarta (Church)
c. Vihara Dharma Bhakti (Figure 2a), West Jakarta (Monastery)
d. *Masjid Al Makmur* (Figure 2b), Central Jakarta (Mosque)

Figure 1(a) shows the cemetery of one of the hero that is abandoned and it is only maintained by his beneficiary using his own money.

(a) (b)

Figure 1: (a) Makam Pangeran Wiraguna and (b) Gereja Koinonia.

Figure 1(b) shows an old and historical building of the church in Jakarta (Gereja Koinonia). Physically, its building is still preserved. There are still many activities there. The problem is, as the historical and sacred building, there seems no privacy between the building and the environmental around. Only a simple gate that bounds that building to the street in front and the distance is very short.

(a) (b)

Figure 2: (a) Vihara Dharma Bhakti and (b) *Masjid Al Makmur*.

Figure 2(a) is an old Vihara called Dharma Bhakti. It’s considered to bring many blessings for the people who take worship in. The building is still sturdy and well-kept; unfortunately, it is located in the traditional markets area and in a small alley so it can easily be found.

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While Figure 2(b) is one of the old Mosque in Jakarta that located in big trade area in Tanah Abang. It is surrounded by a crowd of street vendors (*pedagang kaki lima*) who sell dates, zam-zam and equipment associated with the Hajj. It's also surrounded the hustle and bustle of the transportation in the junction nearby.

4. Problem Identification

4.1 Pangeran Wirogunan's Thomb, South Jakarta

In 1675 from *Banten*, a different version of the story was narrated, that part of *Surasowan* Palace, where the *Sultan Ageng Tirtayasa* throne was narrated as on fire. Two months after the fire, came *Hendrik Lucaasz* Cardeel, a builder admitted to running away from Batavia because he wanted to embrace Islam and devote himself to the Sultan of *Banten*. Cardeel was assigned to lead the development of the palace, including the dam and the upstream side of the palace resort *Cibanten*, later known as the dam and the palace of *Tirtayasa*. During that time, Sultan Haji continually insisted that he must be crowned Emperor. Finally there was a struggle and war for the throne between father and son. In circumstances of urgency, the Sultan Haji sent envoys to Batavia to request assistance of the Company. Sultan Haji Company finally succeeded in occupying the throne of the Sultanate of Banten, of course with having to meet all the demands of his assistants, the Netherlands.

Kiai Aria Wiraguna, aka Cardeel was sent to Batavia on request to help against the Dutch. For his services, Cardeel was given the title Prince Wiraguna. His tomb was sacred to the community of Batavia (Source De Haan, 1910, 1911, 1935; Colenbrander 1925, Vol.2).

It is very difficult to find the location of the tomb. The location of the tomb had closed by the tall buildings around it (the mall, offices, etc.). We have to ask the people around several times if we want to enter the location of the tomb, and even then not many people who provide information to the right. Finally, we found that there is a small alley in front of a small stall. The small street is the entrance to the tomb like shown by Figure 3.

It is unfortunate that the building is considered to have historical and sacred, just abandoned even located in a narrow alley (more like a dark alley) is overgrown with weeds around it.

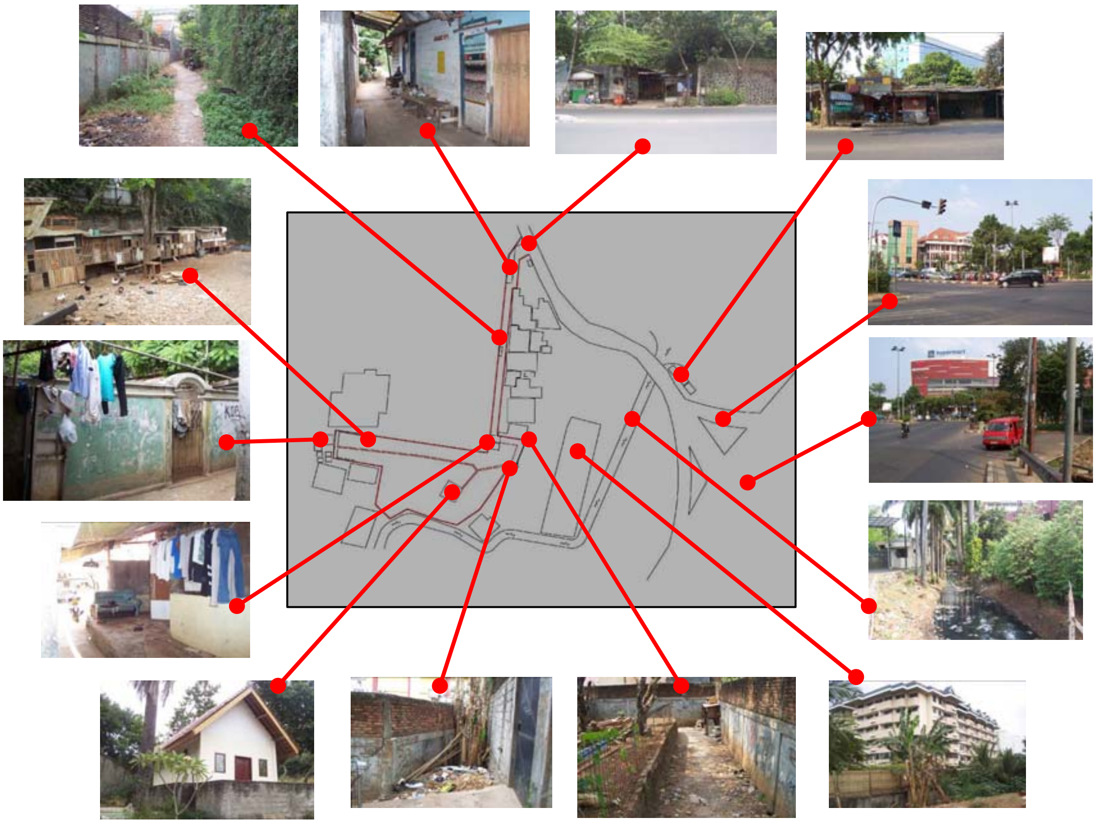

Figure 3: Environment where the tomb Wiraguna is located

As a tomb of a hero who has been credited to the state, it is should not be neglected, even not well maintained. It has just laid in the old pavilion (*pendopo*) as shown in Figure 4. It is only cleaned and swept every Thursday and Friday to welcome the pilgrims who come.

The tomb needs special handling in the management of buildings and the environment especially that sacred tomb is included in the category of objects of cultural heritage.

4.2 Gereja (Church) Koinonia, East Jakarta

It was built in 1911-1916 by the Dutch and originally known as Gereja Bethel/De Betelkerk. From an architectural aspect, the church makes use of gables (triangle wall sections where they meet the roof) and has a pleasant geometric design with nine separate sections.

The church is located in the trade area of East Jakarta (Jatinegara Market). Every Sunday morning, it is disturbed by the street vendors (*pedagang kaki lima*) in front of. The surroundings are very crowded as shown in Figure 5. The problems encountered in the field are as follows:

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1. There is no pedestrian bridge to the church.
2. Height of buildings around the church was not organized, so the existence of the church building to be drowned and no impression of monumental or sacred.
3. Many street vendors are not well managing by government.
4. The distance between the buildings very close to main roads.
5. Pedestrian paths are not used properly.

Figure 4: There are many street vendors surround the Church.

4.3 Vihara Dharma Bhakti, West Jakarta

Vihara Dharma Bhakti built in 1650 by Lieutenant Quo Xun Guan and completed in June 1669 by Captain Guo Guan. This monastery was originally named Guan Yin Ting. In 1755 it changed its name to Jin De Yuan, the name given by Captain Huang Lao Shi. To communities around Glodok, this temple is popularly known as Kim Tek I.

In general the building forms depict the traditional Chinese pagoda. The difference lies in the roof which is divided into three parts, with its handle shaped like a tail wallet. There is also a pair of carved dragon statue and a ball of fire in the middle of the roof that symbolizes the principle of Yin and Yang.

The entire building is painted red, such as fire and blood which symbolizes luck and prosperity. There is a small gazebo in the front yard to burn incense in the form of octagonal roof, i.e., the Pat-Kua symbol, the eight cardinal directions with carved dragon statue at each end. At the end of the roof there is the lotus-shaped cupola.

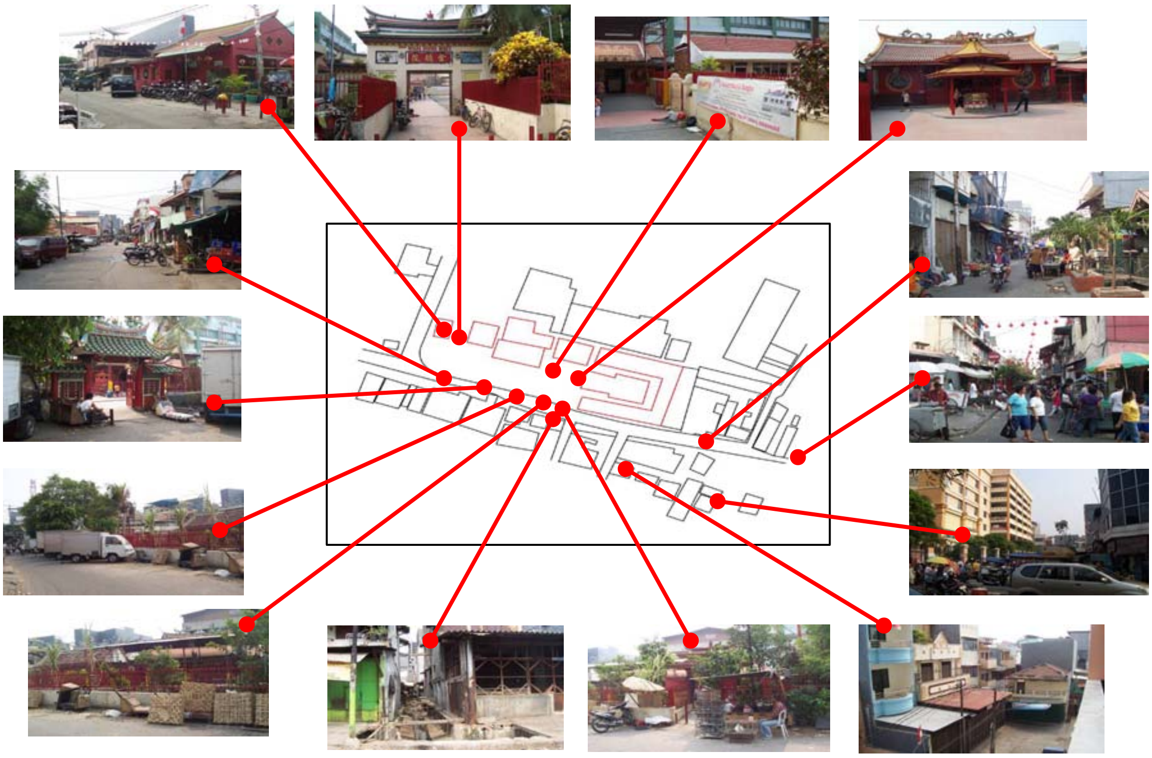

Figure 5: Small alley where the vihara is located, many street vendors and beggars along the entrance of the Vihara.

Things that are encountered in the observations are as follows:

1. It is located in the alley is very small and narrow so that the circulation of vehicles is very crowded and bump with each other as shown in Figure 5.
2. It is located in the area for trade (traditional market).
3. There are many traders and also a lot of beggars who are not closely controlled by the officer as shown in Figure 5.
4. There is plenty of garbage as a waste of markets around the vihara.
5. There are banners mounted on the fence so that the temple is not issued interfere with vision.
6. The distance between buildings very close, so that no impression of religious or sacred anymore.

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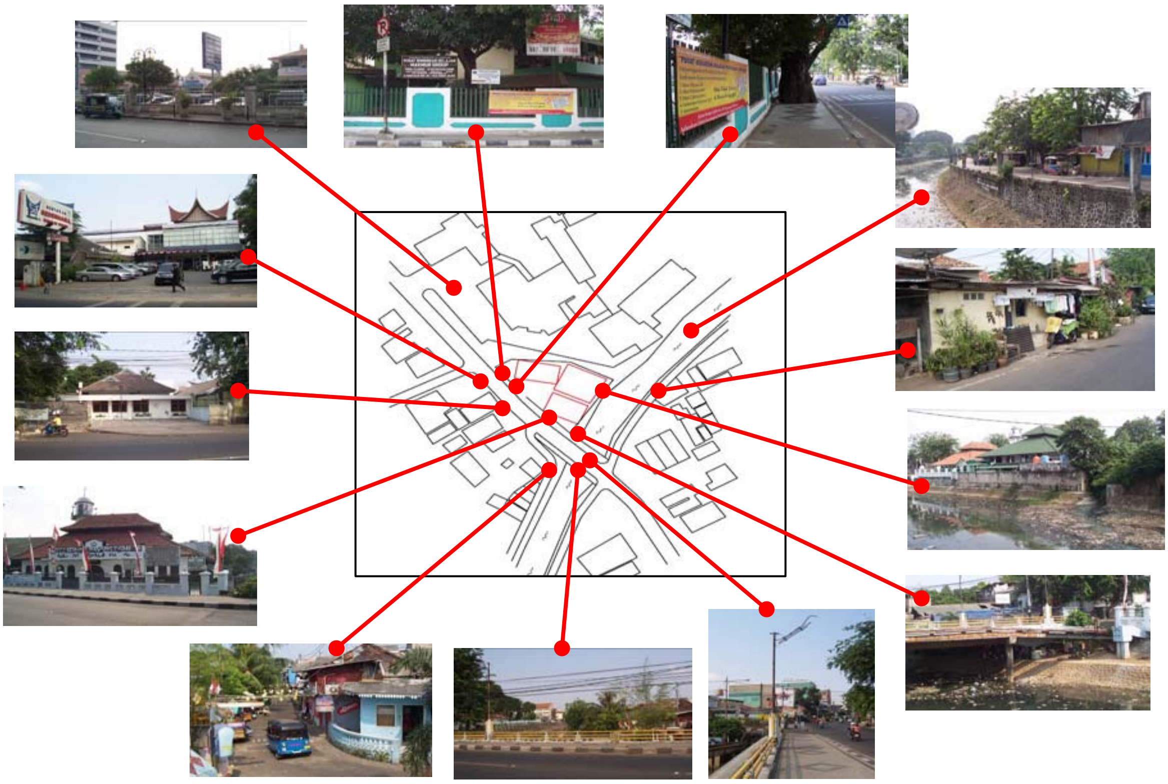
4.4 Masjid (Mosque) Al Makmur, Central Jakarta

History of Al-Makmur Mosque began in 1618 (as a *surau*-small mosque) during the Dutch Colonial Era (VOC). A number of Mataram's people especially people in Tanah Abang, choose this mosque as a place to worship. The mosque is also a place to obtain a strategy to attack the invaders (in the story of the war: *dalam kisah perang : Kerajaan Mataram* lead by Sultan Agung versus VOC lead by Jan Pietersen Coen).



(a) (b)

Figure 6: Condition in front of the mosque (a) and the street (b).

The main building of the mosque remains the same, only a few are already undergoing to repair. This mosque is unique, dome shape and with a pair of rectangular towers (Figure 6). The dome is green and resembles a mosque in the Middle East. Originally, the building was only a small mosque built by a Dutch architect. When the Dutch lost the war, it turned into a Masjid (mosque) Al-Makmur. There is no parking area for visitors, so they park their car on the street in front. There is no pedestrian way around the mosque for the convenience of visitors and it is very near to the main road so that there's no distance between sacred buildings to its surroundings as shown in Figure 6.

5. Discussion

Urban development means the creation of new assets in terms of physical, social and economic structures, but it is at the same time worth noting that each development process often also destroys traditional physical, social and cultural assets derived from our common heritage. Clearly, although not always immediately computable, all cultural assets represent an economic value or at least an option value which has to be taken into consideration in any urban transformation process. In most cases, however, the evaluation of such assets in the planning process cannot be left to the market mechanism, as most urban historic-cultural assets represent 'priceless goods' characterized by external effects which are not included in the conventional 'measuring rod of money. Thus the development of appropriate evaluation methods is of paramount importance here, as otherwise a careful and balanced nurturing of cultural assets will never be realized in the context of an urban sustainability policy. Despite much progress, the operational assessment of the socio-economic and historic-cultural value of monuments - or the impacts of monument policy - is still fraught with many difficulties. Monuments represent part of the historical, architectural, and cultural heritage of a country or city, and usually do not offer a direct productive contribution to the economy. Clearly, tourist revenues may sometimes reflect part of the interest of society in monument conservation and/or restoration, but in many cases this implies a biased and incomplete measure, so that monument policy can hardly be based on tourist values. On the contrary, in various places one may observe a situation in which large-scale tourism (sometimes marked by congestion) even affects the quality of a cultural heritage (Venice of Florence, for example). Thus, there is a need for evaluation and assessment methods which form a balance between priced and priceless 'goods'. This is especially relevant, because in the current period of budgetary constraints there is a risk that budget cuts in the public sector will affect first the 'less productive' or 'soft' sectors such as monument conservation, arts, and so forth. Therefore, it is necessary to pay due attention to the socio-economic and historic-cultural significance of our heritage, in the interest of the notion of sustainable cities.

For religious cultural heritage building, at least we arrange the environment monumentally. The building should be a distance from the street. To cause a monumental impression, we should give the proper distance from the main road. The entrance to religious buildings should be cleared of vendors, billboards and things that can reduce his holy place. Monumental

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impression can be created by providing an open space in front of the building that can serve as a place of ceremony or gathering. Heritage buildings belonging to Class A category should undergo a lot of treatment without changing the shape or form at the buildings.

6. Conclusion

Based on field observations, the existence of historic religious buildings and historic tombs in Jakarta has not got a good handling. Environment around the building were observed not to be a sacred environment but turned into a seedy neighborhood. Decades of government in Jakarta, do not have a policy related to the presence of historic buildings. Development policies more geared to the development of a commercial nature or that provide high income.

Physically, many of these buildings were damaged. There is no boundary between the environments surrounding the parcel on which the building is located. The function of the buildings and surrounding activities do not support the existence of a sacred building but it makes it a gloomy / slums.

To formulate a good model of the historic religious buildings, it is necessary to do research on people's perceptions, especially those living in the surrounding area. Studies of historic religious buildings also aim to preserve these buildings in order to be image / landmark of the city and also object of tourism.

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8. References

Altman, Irwin, dan Martin M. Chemers. (1984). Brooks/Cole Publishing Company. Cultural and Environment, 20-59.

Azra, Azyumardi in Heuken S.J., Adolf, Mesjid-mesjid Tua di Jakarta. (2003). Yayasan Cipta Loka Caraka, Jakarta. Masjid sebagai Refleksi Peradaban Islam, 35-45.

Dijk, Kees van in Peter J.M. Nas and Martien de Vletter (eds.), Masa Lalu dalam Masa Kini: Arsitektur di Indonesia. (2009) PT Gramedia, Jakarta. Perubahan Kontur Masjid, Djajadi, M. Iqbal. (1990). Jurusan Sosiologi FISIP UI, No.1. Pandangan Penghuni terhadap Rumah yang Dibangun Perumnas dan BTN.

Eagles, Paul F. J., et.al. (2002). Adrian Phillips (ed.), World Commission on Protected Areas, IUCN Gland, Cambridge. Sustainable Tourism in Protected Areas: Guidelines for Planning and Management.

Eckardt, Wolf Von. (1967). Delacorte Press, New York. A Place to Live: The Crisis of the Cities, 231-239.

Goldsteen, Joel B. and Elliot, Cecil D. (1994). Van Nostrand Reinhold, New York. Designing America: Creating Urban Identity,

Groote, Peter and Haartsen, Tialda in Brian Graham dan Peter Howard (eds.), The Ashgate Research Companion to Heritage and Identity. (2008). MPG Books Ltd, Great Britain. The Communication of Heritage: Creating Place Identities.

Herlianto. (1997). Penerbit Alumni, Bandung. Urbanisasi, Pembangunan, dan Kerusuhan Kota, 29-60.

Heuken S.J., Adolf, 2003a. (2010). Yayasan Cipta Loka Caraka, Jakarta. Gereja-gereja Tua di Jakarta, 1-288.

Heuken S.J., Adolf, 2003b. (2010). Yayasan Cipta Loka Caraka, Jakarta. Mesjid-mesjid Tua di Jakarta, 1-155.

Lynch, Kevin. (1960) Cambridge, Mass. : MIT Press. The Image of The City.

Pocock, Douglas, and Hudson. Ray, (1978). Macmillan Press Ltd., London. Images of the Urban Environment, 69-83.

Prasidha, Nyoman Teguh. (1999). Tesis Program Magister Perencanaan Wilayah dan Kota Institut Teknologi Bandung, Bandung. Peranan Aspek Tata Ruang Perkotaan dalam Mewujudkan Identitas Kota Baru, Studi Kasus: Kota Baru Bumi Serpong Damai.

Prasidha, et al., (2011). Program Hibah Penelitian Depdiknas Jurusan Arsitektur Fakultas Teknik, Universitas Pancasila. Model Penataan Kawasan Bangunan Cagar Budaya Bernilai Religius Untuk Menjaga Kelestarian dan Meningkatkan Citra Kawasan.

Prawesthi D., Ashri. (2009). Program Hibah Kompetensi Depdiknas, Jurusan Arsitektur, Fakultas Teknik, Universitas Pancasila. Model Peningkatan Kualitas Perumahan di Kawasan Wisata: Studi Kasus: Kawasan Wisata Setu Babakan, Jagakarsa Jakarta Selatan.

Rapoport, Amos. (1977). Pergamon Press, New York. Human Aspects of Urban Form Towards a Man – Environment Approach to Urban Form and Design.

Salmon, Cl., and Lombart, D. (2003). Yayasan Cipta Loka Caraka, Jakarta. Klenteng-klenteng dan Masyarakat Tionghoa di Jakarta.

Shirvani, Hamid. (1985), Van Nostrand Reinhold, New York. The Urban Design Process.

Sumalyo, Yulianto. (2006). Gadjah Mada University Press, Yogyakarta. Arsitektur Mesjid dan Monumen Sejarah Muslim, 35-49.

Vletter, Martien de., in Peter J.M. Nas dan Martien de Vletter (eds.), Masa Lalu dalam Masa Kini: Arsitektur di Indonesia. (2009). PT Gramedia, Jakarta. Modernitas di Kawasan Tropis: Gereja.

Walmsley, D.J. (1988). John Wiley & Sons, New York. Urban Living: The Individual in the City, 80-141.

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