國立雲林科技大學
九十三學年度博士班招生入學考試試題

所別：設計學研究所
科目：設計研究方法

說明：本試題共有五大題，請依序並標明題號，詳答於答案卷上，可以不用抄題。
可以中文或英文作答。

一、Please explain individually how "**deductive reasoning**", "**inductive reasoning**", "**abductive reasoning**" and "**adductive reasoning**" works in the reasoning of design(25%)。

二、在設計學領域常被使用的「調查研究法」(Survey Research Method）中，約可分爲（1）描述性調查及（2）分析性調查。前者重於計算、統計，後者則重於找出研究變相之間的關係及類別。請試以範例就「描述性調查」中有關於取樣（Sampling）的重點與兩種取樣的類別說明之。(25%)

三、何謂「紮根理論」(grounded theory）？一個良好的「紮根理論」必須考慮那些要件（亦即要達到那些標準才是一個良好的「紮根理論」）？ (25%)

四、設計研究可以分爲兩個層次：一爲設計研究方法論的層次，另一爲設計研究方法的層次。請問設計研究方法論所探討之議題爲何？其目的爲何？而設計研究方法，所探討的議題爲何？其目的爲何？(10%)

五、簡答題(共計 4 題，任選 3 題作答，每題 5 %，需抄英文題目作答，總計 15%)
作答時需先將題目翻譯成設計研究領域中文用語，併予以定義，另說明這些研究方法、分析技術或效標在設計研究領域之可能應用，以案例說明之。

(1)Participant observation
(2)Construct validity
(3)Cluster analysis
(4)Ethnography

國立雲林科技大學
九十三學年度博士班招生入學考試試題

所別：設計學研究所
科目：設計理論與文獻

說明：本試題共有四大題，請依序並標明題號，詳答於答案卷上，可以不用抄題。
可以中文或英文作答。

一、面對一個以知識經濟爲核心的新世紀，高等教育所扮演的角色愈來愈重要。我國高等教育包括專科學校、技術學院、大學及研究所。依據教育部（2002）統計 91 學年度大學校院共有 1,904 個研究所，研究生 122,130 人，其中博士班 536 所，學生 18,705 人，碩士班 1,880 所，學生 103,425 人，整個高等教育機構在學學生數已超過十萬人。而昔日設計教育偏重「技術導向」，在面對新時代的挑戰，試闡述現階段台灣設計領域高等教育（專科生至博士）各層級的發展重點（10%），並以您個人之看法勾勒出台灣未來設計人才養成應發展的重點（15%）。

二、Richard Buchanan considers design to be an architectonic art that can unify other, more narrowly conceived arts and crafts: "Design is what all forms of production for use have in common. It provides the intelligence, the thought or idea-of course, one of the meanings of the term *design* is a thought or plan- that organizes all levels of production, whether in graphic design, engineering and industrial design, architecture, or the largest integrated systems found in urban planning." According to the quotation above, what is your opinion on the meaning of ***design***? (25%)

三、【1】請以中文說明下列文獻之要義（10%）；【2】請依下列文獻提出您的論述（15%）。

It is important to encourage students to adopt a problem-oriented attitude towards creativity and originality. To understand and accept that as a creator, one always starts out from objects and design solutions that are already to hand (whether it is a matter of artefacts or naturfacts), and that one always builds on the inventions and contributions of others - that it is impossible to avoid this and that this is characteristic of every profession – all this is a precondition for learning to appreciate the significant contribution made by others to the success of one's own design results. This insight strengthens the will and the motivation to learn from others without feeling that it is spoiling one's own originality and artistic innocence. It is only when we realise that our own design is always a link in a redesign process that we achieve better control over our own work, because we better understand *what* and *why* and *how much* we adopt of other people's solutions, whereby we can be more critical of our own work processes.

Meanwhile, there is no hiding the fact that the redesign perspective can have the effect of a douche of cold water on many designers, in that it may be perceived as belittling the designer's own contribution. I will therefore, in conclusion, attempt the role of a mediator.

I have argued in favour of a *redesign* perspective because I have felt that the opposite, the *design* perspective, has reigned largely supreme. Meanwhile it is important that neither the design perspective nor the redesign perspective should reign supreme, but that both should be present as two equally relevant and equally real perspectives. The notion of design has a tendency to place the designer's own creative contribution under a magnifying glass. Important as this is for the creator, it at the same time promotes a short-sighted perspective of one's own work, because the contributions of others only come into the field of vision to a very limited extent. We are then inclined to see ourselves as sole creators. But we pay for this satisfaction in the form of the sole creator's mental isolation and fear of underachievement. The redesign concept on the other hand can be accused of undervaluing the work of the individual designer because it focuses on the supra-individual, collective, cooperative and cumulative aspects of design activity. We see our own contributions as though through a "minifying glass" that brings also the contributions of others into view. But as a bonus we achieve the certainty that we are not alone, that we are not forced to think of everything for ourselves, and that, as designers, we are all the time part of a distinguished team of inventive and imaginative colleagues even if we perhaps never meet them personally, and even if the majority of them are no longer alive.

There is nevertheless a tension between the two perspectives, and it is easy to give in to the temptation either to reduce design to redesign, or to base ourselves only on the design perspective. Both are essential if we are to understand what being a designer is about. It is only when we are able to allow both these perspectives to exist peacefully side by side in our heads that we achieve a realistic, and civilised, view of design. This is not easy, but we can, and should, practise it – and we ought also to teach it to our students.

Seeing design as redesign is seeing the creator as the re-creator and co-creator. But it is not so that the creator is lost in the perspective of redesign. One can certainly not be a creator without being a re-creator and co-creator. But neither is it possible to be a re-creator and co-creator without being a creator.

四、請閱讀 **What Does the Horzontal-Vertical Illusion Show Us about Size Perception ?** 此篇論文(參見附件)後，簡述實驗一及實驗二規劃重點及實驗結果 (10 %)，並評論此研究可以改進之處 (5 %)。另請依據實驗結果及你的評論，重新規劃一個實驗，包含實驗目的、研究方法、資料蒐集工具及資料分析技術等。(10 %)

What Does the Horizontal-Vertical Illusion Show Us about Size Perception?

Sérgio S. Fukusima

Laboratory of Perception and Psychophysics
Department of Psychology and Education , FFCLRP, University of São Paulo
Av. Bandeirantes, 3900
14040-901 Ribeirão Preto SP Brazil
E.mail: fukusima@usp.br fax: (016) 633 5015

Abstract

Two experiments were carried out to investigate the horizontal-vertical illusion using the psychophysical method of adjustment and the double staircase method. Results from both experiments indicated that the eye movement and the stimulus time exposure can affect the magnitude of the illusion, but they cannot affect the illusion pattern in function of the location of the stimuli in the visual fields and of the location of vertical line on the horizontal line. It is suggested that size perception involves specialization of the right and the left brain .

1: Introduction

Since the middle of the nineteenth century, visual or optical or geometric illusions as they are called, have being reported in academic literature. Although most of them are considered only as curiosity, some researchers in perception call attention to they are potential sources of information of how the perceptual and sensorial systems work [1]. Among of these illusions, the horizontal-vertical illusion is one in which a vertical line is perceived greater than a horizontal line of the same physical size [2, 3, 4], and it is an indubitable instance that visual size perception is anisotropic. This illusion was first reported by Fick in 1851 [5] and still unexplained, although there are hypotheses that considered it as an optical, or a psychological, or a neurophysiological outcome [1, 4, 6, 7]. A promise way to investigate this perceptual phenomenon is the use of psychophysical methods, by which the sensorial, perceptual or psychological events such this can be quantified.

In order to shade some light on the mechanisms or processes involved in this illusion, two psychophysical experiments were planned.

2: Experiment 1

In this experiment the horizontal-vertical illusion was investigated in function of the position of the vertical line on the horizontal line of different sizes.

2.1: Method

2.1.1: Subjects. Ten adults (5M and 5F) from the University of São Paulo at Ribeirão Preto participated as paid subjects in this experiment. Their age varied from 19 to 32 year old, and their visual acuity were 20/20 or above for both eyes with or without corrective lenses.

2.1.2: Material and equipment. A compatible microcomputer PC 486-DX2, 50MHz, with a Diamond SpeedStar24 video board, 1Mb VRAM, and with a 15" monitor NEC-4FG at resolution of 1024 x 768 pixels were used to present the stimuli at 50 cm away from the observer in an illuminated room. The stimuli were configurations of a horizontal and a vertical line, drawn in black-three-pixel-thick lines on a gray screen background. The sizes of the horizontal line were of 80, 160, 240, 320 and 400 pixels (length of 2.29, 4.57, 6.84, 9.09, and 11.31deg respectively). The initial size of the vertical line could vary randomly from 70 to 130% of the

0-8186-8058-X/97 $10.00 © 1997 IEEE

horizontal line presented. It could be presented on the horizontal line at one of nine positions (see Fig.1).

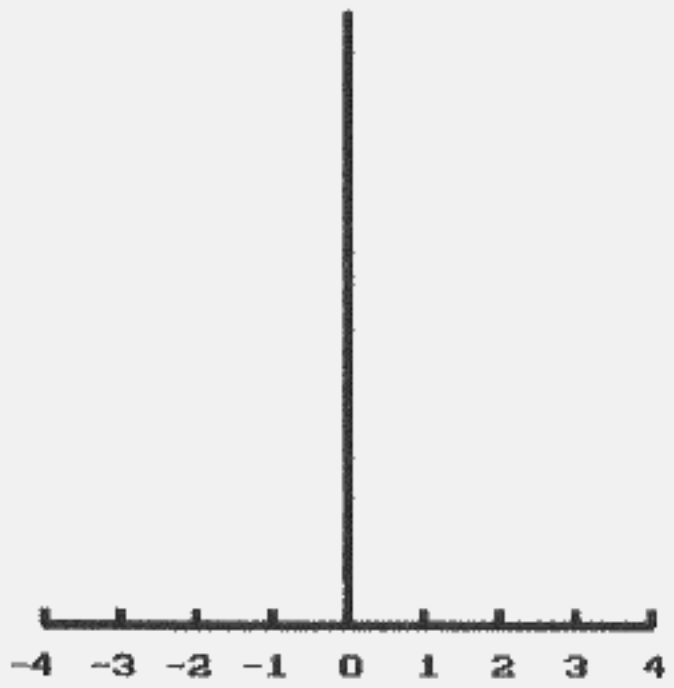

Figure 1. A horizontal-vertical illusion configuration with the vertical line at the central position of the horizontal line. Positive numbers indicated positions of the vertical line at the right of the central point and negative ones at the left.

These positions were identified as -4, -3, -2, -1, 0, 1, 2, 3, and 4. The position 0 was the central point of the horizontal line. The position -4 was the left extreme and the position 4 was the right extreme of the line. Each position was separated from the next by a step of the 1/8 of the total size of the horizontal line presented. Combining sizes of the horizontal line and positions of the vertical line, forty five stimuli were possible.

2.1.3: Procedure. Each stimulus was presented five times in random order. The task of the subject was to adjust the vertical line to be perceived as the same size of the horizontal line. For this, the subjects pressed from the keyboard the key "a" or "s" to increase the line by steps of three and one pixel respectively or the key "f" or "d " to decrease the line by the same steps respectively. The relative errors were calculated by :

$$\text{Error (\%)} = 100(SS-PSE)/SS,$$

where Error(%) is the relative error, SS is the standard size from the horizontal line, and PSE is the Point of Subjective Equality (mean of the size of adjusted vertical line). This error was taken as the measurement of the illusion. Positive errors indicate that the vertical line were overestimated, i.e., the vertical line was adjusted smaller than the horizontal line to both be perceived with the same size. The negative errors indicate that the line was underestimated, i.e., the vertical line was adjusted bigger than the horizontal line. Time exposure of stimuli and eye movement were not controlled.

2.2: Results

The means of the relative errors were plotted in Fig.2.

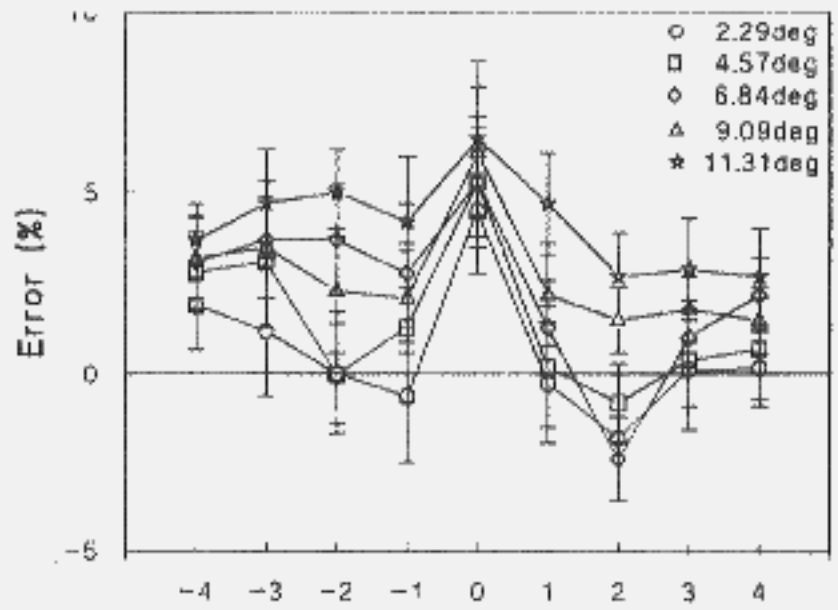

Figure 2. Means of relative errors of the adjustment of the vertical line in function of its position on the horizontal line and the size of the horizontal line. Vertical bars indicate standard errors .

An ANOVA for repeated measurement (5 sizes x 9 positions) indicated that the size of the horizontal line [$F(4,36)=6.18$; $p<0.01$] and the position of the vertical line on the horizontal line [$F(8,720=4.07$; $p<0.001$] affected the illusion. There was no significant interaction between both factors [$F(32,288)=1.04$; $p>0.05$]. Stimulus configurations above 6.84deg trended to be more overestimated than the smaller configuration. And the illusion trended to be stronger at the center of the horizontal line, decreasing toward the intermediate positions 1 and 2 (right side of the center of the horizontal line) and sometimes presenting a reversion of the illusion at the position 2 for size smaller than or equal to 6.8deg. In the left side of the central point of the horizontal line, the illusion trended also to decreased at the intermediate position -1 and -2, however, the reversion of the illusion did not happen so strong as it had in the right side. In general, errors in the left side was more overestimated than those ones in the right side.

2.3: Discussion

The position of the line on the horizontal line and its size affected the horizontal-vertical illusion. However, the pattern of this result was not the same as that one found by Kunnapas [2], in which the illusion was adjusted to a linear function that decrease symmetrically from the central position toward both extremes of the horizontal line. The results from this experiment presented an abrupt tendency of reduction of the illusion at the intermediate positions in both sides of the central position. And this abrupt reduction was more noticed in the right side, where sometimes for size smaller or equal to 6.84deg the illusion reverted.

3: Experiment 2

One question about Exp.1 is how much the eye movements can affect the illusion. In order to investigated this problem in this experiment, the horizontal-vertical illusion was investigated with control of the time exposure of stimuli, the eye movement, and the shape of the frame around the stimuli. To avoid sessions longer than two hours and problems with space available from the center of the screen, only the three first sizes and five positions of the vertical line at the horizontal line from Exp. 1 were chosen.

3.1: Method

3.1.1: Subjects. Six adults (3 M and 3 F) from the University of São Paulo at Ribeirão Preto participated as paid subjects in this experiment. Their age varies from 19 to 24 year old. All had visual acuity 20/20 or above for both eyes with or without corrective lenses.

3.1.2: Material and equipment. The same microcomputer and device from Exp.1 were used in a dark room. The stimulus was a horizontal and a vertical line drawn on black screen with a white-one-pixel-thick line. The size of the horizontal line was 80, 160, and 240 pixels (length of 2.29, 4.57, and 6.84deg respectively). The initial size of the vertical line could be 75 and 125% of the horizontal line presented; and it varied by step of 5% of the size of the horizontal line. The vertical line was presented in one of the 5 positions at the horizontal line (-2, -1, 0, 1, and 2). The position 0 was the center of the horizontal line. the position -2 and 2 were equivalent respectively to the position -4 and 4 of Fig.1, and the position -1 and 1 were equivalent respectively to the positions -2 and 2 of Fig.1. The intersection of the vertical and horizontal line was always the center of the screen. The screen was covered with a black-paper mask with a central-circular-18cm-diameter window. This was done to avoid any frame effect from the rectangular shape of the monitor screen.

3.1.3: Procedure. Each subject had his/her left eye blindfolded, and was sat in front of the screen. His/her head was on a chinrest from 50 away from the center of the screen, which was adjusted to the eye level and straight ahead to the right eye. A computer program presented the stimuli using the double staircase method with an ascendant and a descendent sequence of 50 trials [8]. In each trial the stimulus was presented for 100ms. This time exposure was enough to avoid any eye movement after the glance fixation. In each trial the task was to judge whether the vertical line was bigger or smaller than the horizontal line by pressing "a" or "d" respectively from the keyboard. The increment or reduction of the vertical line in each subsequent trial was 5% of the size of the horizontal line used. The Point of Subjective Equality (PSE) was first calculated, and later the relative errors using the Equation 1.

3.2: Results

The means of relative errors were plotted in function of the position of the vertical line at the horizontal line and of the size of the horizontal line in Fig.3.

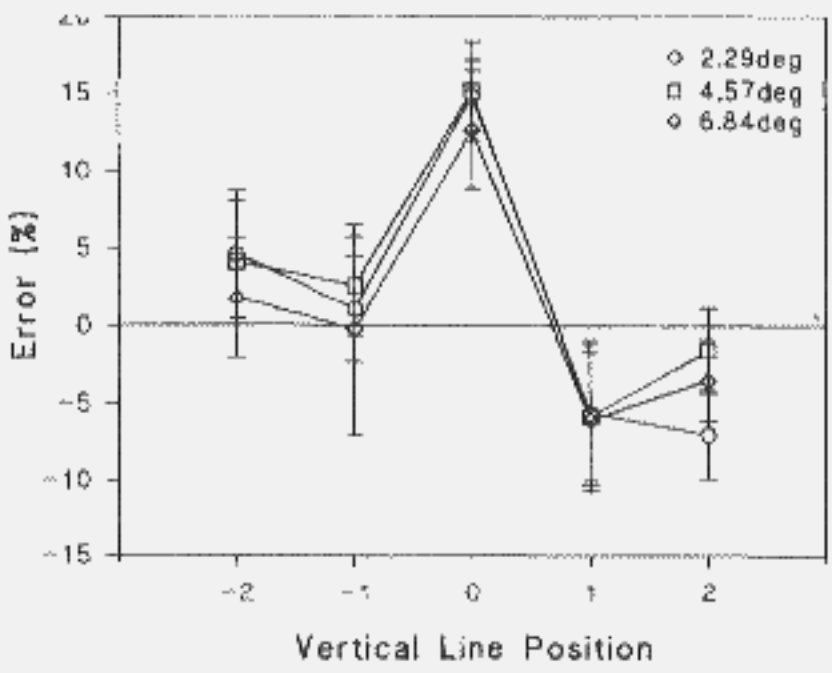

Figure 3. Means of relative errors of the adjustment of the vertical line in function of its position on the horizontal line and of the size of the horizontal line. Vertical bars indicate standard errors.

An ANOVA for repeated measurement (3 sizes x 5 positions) indicated significant effect of position [$F(4,20)=9.48$; $p<0.001$] but no effect of size [$F(2,10)<1.0$] and interaction between size and position [$F(8,40)<1.0$]. The relative errors were bigger in the central position of the horizontal line and smaller at the positions near the extremes. Similarly to Exp.1, there was a tendency of the errors to decrease more at the intermediate position in both side of the horizontal line, breaking down the linearity from the center toward the extremes of it. If the whole or the most of the horizontal line is in the right side of the visual field the vertical line is overestimated. If whole or the most of the horizontal line is in the left of the visual field the vertical line is underestimated, reverting the illusion.

3.3: Discussion

Although the magnitude of the relative errors at the central position and the tendency of underestimation at the right side were stronger than that found in Exp.1, the illusion still presented the same pattern. So, it seemed that eye movement can reduce the magnitude of the illusion but not its pattern in function of the position of the vertical line on the horizontal line. One possible explanation of the difference in the illusion magnitude is that the time exposure is crucial to determine the magnitude of the illusion. As in Exp.1 there was no limit of the time exposure in each trial, subjects could had more time for processing the visual information and had more resource to correct their performance to reduce the error. The difference between the result from the left and the right side of the central position was more noticeable. The postions at the left side trended to present overestimation while the positions at the right side trend to presented underestimation of the vertical line, i.e., reversion of the illusion was more frequent in the last case.

4: General discussion

At this point, both experiment indicated that the horizontal-vertical illusion is affected by the position of the vertical line at the horizontal line but not as the same pattern reported by Kunnapas [2]. The illusion is strong if the size of the horizontal line is bigger than 6.8deg , and it is not so different if the size is in between 1.4 and 6.8deg. Eye movement and time exposure of the stimulus are not factors that affect the pattern of the illusion in function of the vertical line position, but it trends to change its magnitude toward over or underestimation. This fact can be related to two hypotheses: 1) the eye-movement presented during the adjustment trend not reduce the illusion, or 2) the illusion is determined by the lack of information that suffice the correction during the visual information processing for size perception. And it indicates that the more the time, the lesser the error or the illusion. Also, from both experiments, and especially from Exp.2, the difference between errors from the left and the right side of the visual fields suggest that size comparison should be mediate by the brain laterality. The illusion is hold with overestimation and sometimes it vanishes in the case that the whole or the most of part of the horizontal line is presented to the left brain (the case that the vertical line is presented at the left side of the central position). In case that it is presented to the right brain (the case that the vertical line is presented at the right side of the central position) there is reversion of the illusion. For this point of view, Cohen *et al.* [9] had indicated a possible anatomical area for this asymmetry, and Chukova [10] and Fukusima [11] indicated this asymmetry psychophysically.

The analysis of the quantification of the horizontal-vertical illusion can provide information of how possible physiological mechanisms are involved, and it is possible that it can also benefit cybernetic models of the human vision in the future.

5: References

[1] Coren, S. and Girgus, J. S.. *Seeing is Deceiving:Psychology of Visual Illusion*. LEA: Hillsdale, NJ, 1978.

[2] Kunnapas, T. M.. An Analysis of the Vertical-Horizontal Illusion. *Journal of Experimental Psychology, 49*:134-140, 1955.

[3] Ritter, S. M.. The Vertical-Horizontal Illusion. *Psychological Monograph, 23*:whole N.o 101, 1917.

[4] Stacey, B. G.. Explanations of the Horizontal Vertical Illusion and the Foreshortening of Receding Horizontals. *Life Sciences, 8*:1237-1246, 1969.

[5] Fick, A.. *De Errone Quodam Optic Asymmetria Bulbi Effecto*. Marburg: Koch, 1851.

[6] Avery, G. C. and Day, T. H.. Basis of the Horizontal-Vertical Illusion. *Journal of Experimental Psychology, 81*:376-380, 1969.

[7] Thompson, J. G. and Schiffman, H. R.. The Influence of Figure Size and Orientation on the Magnitude of the Horizontal-Vertical Illusion. *Acta Psychologica, 38*:413-420, 1974.

[8] Cornsweet, T. N.. The Staircase Method in Psychophysics. *American Journal of Psychology, 75*:485-491, 1962.

[9] Cohen, L., Gray, F., Meyrigac, C., Dehaene, S., and Degos, J. D.. Selective Deficit of Visual Size Perception: Two Cases of Hemimicropsia. *Journal of Neurology, Neurosurgery, and Psychiatry*, *57*:73-78, 1994.

[10] Chukova, S.. Size Discrimination in Different Visual Field: Magnitude of "Equal Images" illusion in fovea. *Perception*, Supplement, 103, 1994.

[11] Fukusima, S. S.. Perceived Size of a Line in Different Orientations Compared to the Size of a Horizontal One. *Investigative Ophtalmology & Visual Science*, *37*(3), Supplement, 1073, 1996.

Supported by CNPq #300253/94-0 and FAPESP #95/9263-4.