7th WMCAUS 2022
World Multidisciplinary Civil Engineering - Architecture - Urban Planning Symposium
13-17 June, 2022 - Prague (Czech Republic)
www.wmcaus.org

BYDGOSZCZ UNIVERSITY OF SCIENCE AND TECHNOLOGY

IMAGE USING INTERFERENCE EFFECTS IN THE GLASS FACADE

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Introduction

The visual interferences phenomenon, known as moiré patterns, is currently one of the more often explored and more interesting visual phenomena that appear in various forms of art as well as in architecture. In the latter, it constitutes an important artistic process paving the way to new compositional values. It has become popular due to the fact that people are looking for new ways of expression while at the same time wanting to go back to minimalism and geometry.

The purpose of this study is to identify methods of application for this phenomenon in visual arts, and answer how it can be transferred to architecture and applied in glass façades. The paper will present various forms by which the moiré patterns can be achieved, looking at whether a transfer to architecture and merging with a glass façade are possible. It is meant to be a step on the way to creating a compendium of knowledge on this phenomenon and already existing functional solutions in architecture. One of the objectives is to examine how useful visual interferences can be in making advanced façade systems. The study will then be used in the making of a double-layer illuminated façade. An important aspect of this work is the creation of the typology, classification and characteristics of each kind of such arrangements.

Material and Methods

The publication will analyze how moiré patterns are applied in visual arts in terms of their use in a glass facade. First, three systems were analyzed: Various possibilities of compiling line graphics, (a) - parallel position, (b) - bipolar position, (c) - mixed system.

Parallel systems were selected for further research. Two models of the implementation of the image will be created and analyzed, one is black and white, the other is colored. Based on the previous analysis, it was decided to create a geometric image in a parallel location. The print on glass was composed of three image layers: - Proper print (1), - Reverse arrangement of the design (2), - Covering layer (3).

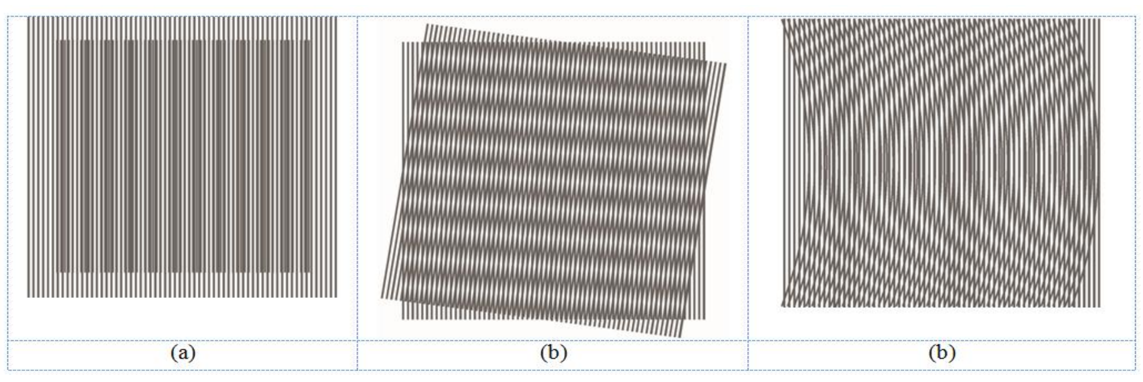

FIGURE 1. Different options of juxtaposing linear prints, (a) – parallel location, (b) – bipolar location, (c) – mixed arrangement

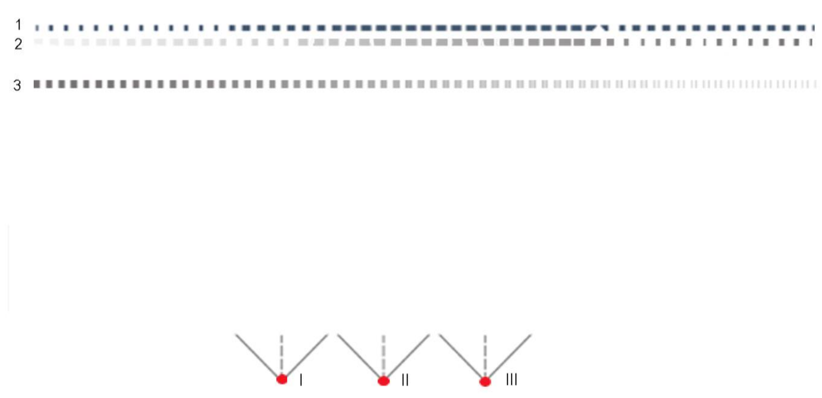

FIGURE 2. Image structure pattern relative to viewer location. 1 – Proper print; 2 – Reverse arrangement of the design; 3 – Covering layer; Three observer locations I, II, III.

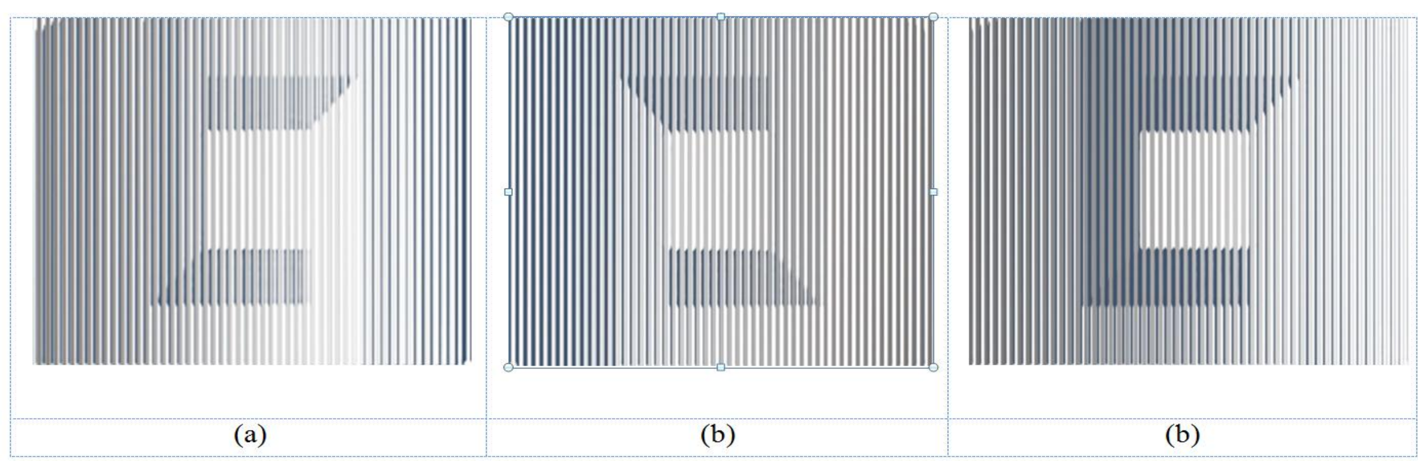

FIGURE 3. Analysis of a perceived change in the image depending on viewer location: (a) – Location I; (b) – Location II; (c) – Location III.

A similar experiment was conducted on a colour print. It was decided that an orthogonal image will be created in a parallel location that will produce parallel interference arrangements on the surface, using colours that shine through each other: yellow, magenta, blue. The design on glass was composed of three image layers (Figure 5):
- Proper print (1) – non-transparent image – it may be a layer of the building's cladding – dark blue, magenta;
- Reverse arrangement of the design (2) – semi-transparent image – magenta, cyan;
- Covering layer (3) – non-transparent image – from the outside – yellow and grey.

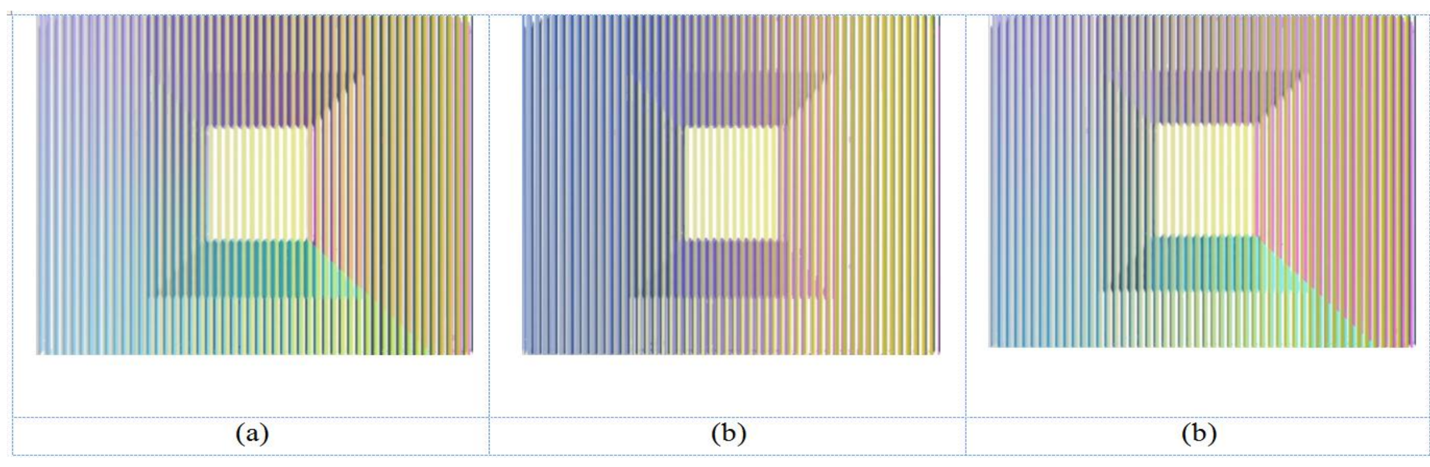

FIGURE 4. Analysis of colour synthesis depending on viewer location. Simulation on a model composed of coloured layers: (a) – Location I; (b) – Location II; (c) – Location III.

Results

An analysis of an image composed of linear elements has shown that (Figure. 1):
- Interference density increases as we increase the difference in spacing between the linear components of two image layers,
- Interference density increases as the angle between two layers of a linear image grows,
- Increasing the distance between print stripes along a curve results in increased density of interference components; while increasing the distance in the layer between straight stripes results in reduction of interference components.

Having analysed the means of expression used in each case, it was concluded that the majority of the way in which an image is applied may be transferred to glass designs on façades. Great potential is seen in glass installations composed of vertical elements. An image with the use of three image layers was adopted as the model. All layers of the image have been composed of parallel stripes, which are either visually activated or become covered, depending on the viewer location relative to the image.

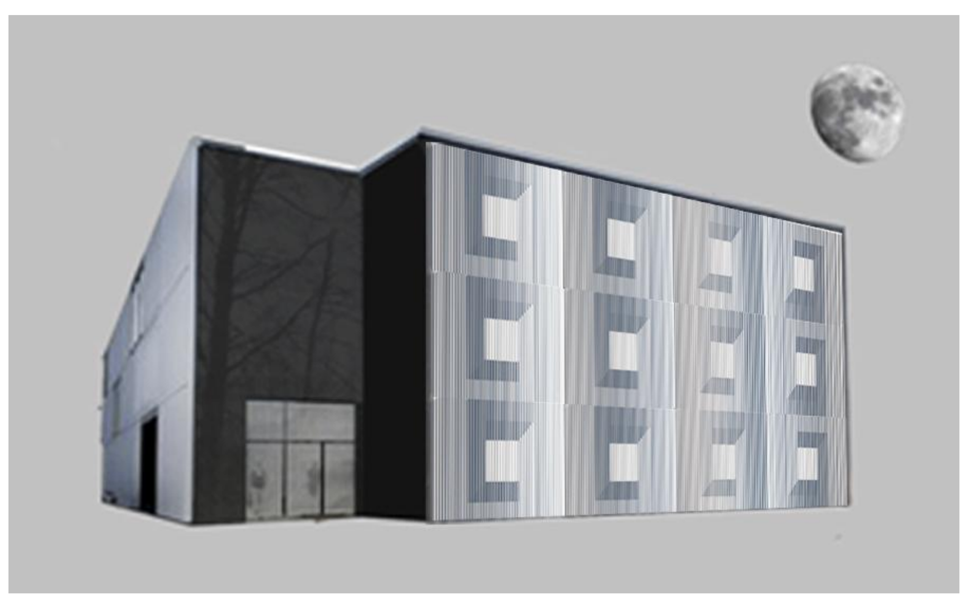

FIGURE 1. Application of an image in an architectural model.

Discussions & Conclusions

In monochromatic parallel arrangements, the effect of a changed image may be achieved if three graphical layers are used: two layers of the image are covered with a continuous linear design layer that acts as a covering and cropping screen.

In coloured arrangements, using partly non-transparent and partly transparent designs, image layers with visually changing colours are obtained, as a result of additive or subtractive synthesis. The hues of these colours depend on the viewer location.

Acknowledgements

This material has been supported by the Polish National Agency for Academic Exchange under Grant No. PPI/APM/2019/1/00003