



THE APPLICATION OF GENERIC GREEN SKILLS IN TESSELLATION OF REGULAR POLYGONS FOR ECONOMIC AND SOCIAL SUSTAINABILITY

Abdullahi Musa Cledumas*

Technical And Engineering Education
Universiti Teknologi Malaysia
Nigeria

Yusri Bin Kamin

Technical And Engineering Education
Universiti Teknologi Malaysia
Malaysia

Rabiu Haruna

Technical And Engineering Education
Universiti Teknologi Malaysia
Nigeria

Haliru Shuaibu

Technical And Engineering Education
Universiti Teknologi Malaysia
Nigeria

**Corresponding author's Email: cledumasabdullahm@gmail.com, p-yusri@utm.my*



*Peer-review under responsibility of 3rd Asia International Multidisciplinary Conference 2019 editorial board
(<http://www.utm.my/asia/our-team/>)*

*© 2019 Published by Readers Insight Publisher,
lat 306 Savoy Residencia, Block 3 F11/1, 44000 Islamabad, Pakistan,
info@readersinsight.net*

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).





Research Highlights

The main objective of this paper is to provide an improved modelling system for tessellating the following polygons; triangle, square and hexagon in such a way that it serves as a means of social and economic sustainability. In this paper, tessellation of triangles, square and hexagon that have been improved through the smaller unit called motifs, is purely an improved system from the former system of tessellations of items like figures, pictures and animals. Tessellation can be defined as a design of one or more regular shapes, totally covering a surface without gaps or overlaps. Three regular polygons tessellate. They include the square, equilateral triangle, and hexagon (Press, 2017). The main contributing aspect of this tessellation is the simple modification and modernization of the designs from the prevailing regular polygons where only three regular polygons (triangle, square and hexagon) can be tessellated as mentioned above. This is because they are regular (interior angles are exact divisors of 360°) as compared to using polygons that are not regular or other objects or pictures. This procedure is achieved by reducing the size of each figure consecutively to a smaller size and tessellating each of the reduced figure to the left or right to produce two different patterns of a unit called style. These styles are then merged together to form a new shape.

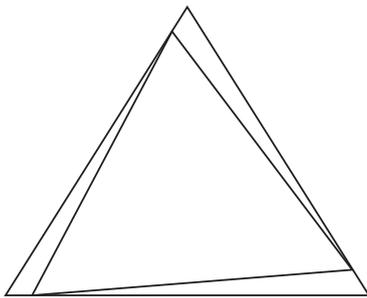
Research Objectives

The main purpose of this paper is to modernize the traditional or old system of tessellating polygons. This paper also demonstrates the application of generic green skills, according to (Zolkifli et al., 2018) Generic green skills are the technical skills, knowledge, values and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community. Therefore, because generic green skills are essential in virtually any occupation to understand and escalate the matters and needs of green growth (Pavlova, 2012), it has played a major role in this work. In this particular modernization it is found that the newly introduced model is superior than the previously tessellating ordinary solid regular polygon, this is because different designs are formed, colours may be introduced in order to give meaningful and good decorating tiles or designs. More importantly, specific tessellations can originate in different areas of life. For instance Fine and Applied Arts, Architecture, some hobbies, clothing textile and design, including modern and out-of-date wears, and many other areas hold examples of tessellations that could be obtained in our everyday life and in our communities.

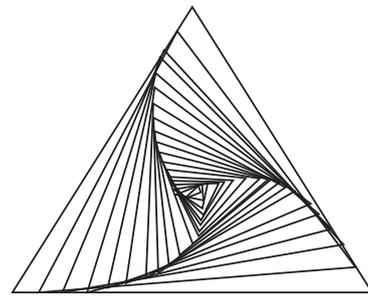
The miracles of Islamic arts and architectural designs, the most familiar visual appearance of Islamic art and architecture, are not just a good-looking by accident but they are expertise designs and creativity. The early pioneers of this expertise used old-fashioned methods of measurement to create amazing geometric arrangements, mostly based on the replication of a single pattern. The results are glorious in their beauty and overwhelming in their finishing (Eric B. 2019)

Methodology and Results

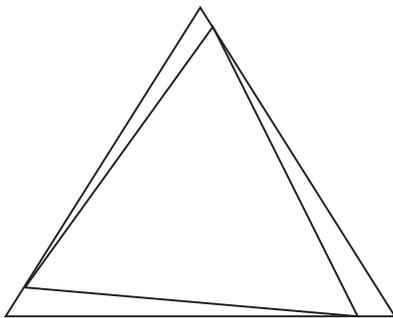




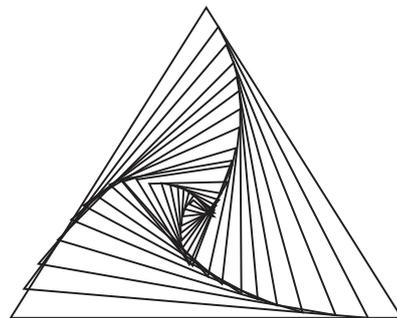
Reducing the size of the triangle continuously and tessellating it to the left will produce a style **A**



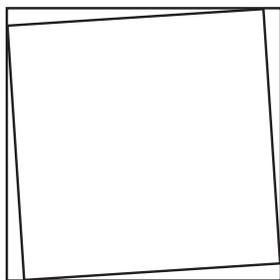
A style **TA** produced by tessellating the triangle to the left



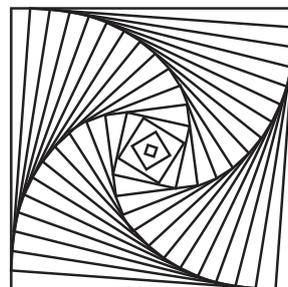
Reducing the size of the triangle continuously and tessellating it to the right will produce a style **B**



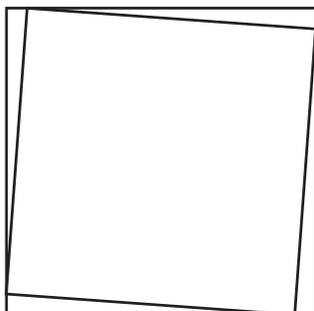
A Style **B** produced by tessellating the triangle to the right



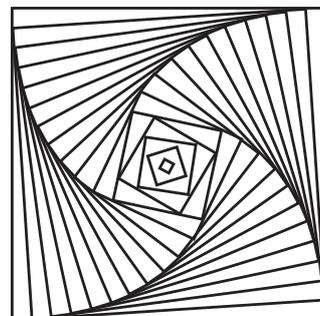
Reducing the size of the square continuously and tessellating each smaller figure to the right will produce this Style



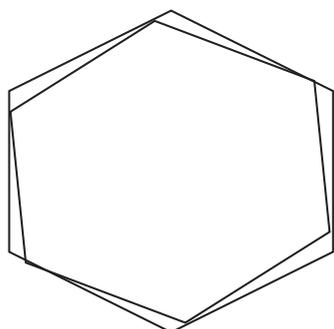
A Style **SA** produced by tessellating the square to the right



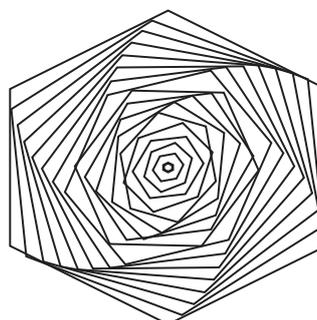
Reducing the size of the square continuously and tessellating each smaller figure to the left will produce this Style



A Style **SB** produced by tessellating the square to the left



Reducing the size of the hexagon continuously and tessellating each smaller figure to the left will produce this Motif



A Motif **HA** produced by tessellating the square to the left

Uses of Tessellation from Polygons

In design and architecture, tessellation refers to the tiling and decoration of walls, floors, or other structures in building with a design of smaller tiles designed out of ceramics, glass, metal leaf, stone, or other ingredients. These tessellations are normally designed either into geometric shapes that are joined together flawlessly in a smaller units or into more multifaceted designs in speciously enormous patterns. These patterns provides continuous and smooth surface coverage. Even though there are many new modernizations, this ancient technique are seen in buildings and wall landscapes in many countries like Turkey, Italy, India, Greece and many other countries. Tessellations are predominantly more prominent in Islamic art, but in most cases prohibits realistic images of any creature or His creations; therefore, all designs always takes an abstract form with mathematical substructures (polygons). Islam did have nabe not gab permit them to make "graven images." They always restricted themselves; in their massed tiles. (Ernest R. Ranucci, 1974). Tessellations are prominent in many areas of life today. Fine and Applied Art, Architecture, Hobbies, Clothing design, including modern and old-fashioned wears and many other parts hold demonstration of tessellations that obtainable today in our everyday settings. Specific examples include oriental carpets, beddings, Islamic Arts, Islamic Architecture etc.

References

- Ernest R. Ranucci, 1974. Master of Tessellations: M.C. Escher, 1898-1972 67, 1898–1972.
- Eric Broug (2019) Islamic Geometric Design 1st Edition retrieved on https://www.amazon.com/Eric-Broug/e/B00279HMU8/ref=dp_byline_cont_book_1
- Pavlova, M., 2012. Generic green skills : Can they be addressed through Technology Education ? 49–57.
- Press, U.C.L., 2017. UCL Press Chapter Title : RIBBED TILE VAULTING : INNOVATION THROUGH TWO DESIGN-BUILD WORKSHOPS Chapter Author (s): PHILIPPE BLOCK , MELONIE BAYL-SMITH , TIM SCHORK , JAMES BELLAMY and DAVE PIGRAM Book Title : Fabricate 2014 Book Subtitle : Negotiating D.
- Zolkifli, M., Hamid, A., Awang, Z., Kamin, Y., Atan, N.A., Mohd, S., 2018. Generic Green Skills : What Do Academician Have To Say 2743–2749.

