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Geometric Harmonization Characteristics of Samarkand Registan Ensemble

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Annotation: This article analysis the secrets of geometric harmony and correlation of the Samarkand Registan ensemble. Also, in the article were proved the regularities of architectural harmonization of buildings in relation to the Registan Square and the issues of proportionality between the squares of the three madrasahs and the Registan Square.

Keywords: geometry, ratio, harmonization, square, principle.

Introduction

As contemporary architecture and urban planning have evolved through time, there is now a need to research past traditions and find solutions to their harmony issues in order to create geometrically harmonious surroundings in cities and to restore and maintain historical cities and monuments. Therefore, it is the professional responsibility of the architectural profession to harmonize the urban environment in a way that is appropriate for people, to create a comfortable environment for their work and rest, and it is becoming increasingly important for architects to address the issue of harmony of architectural forms, people, and the environment when developing projects for cities and villages, residential complexes, public buildings and structures, and parks.

Three Madrasas (Ulugbek Madrasah, Tillakori Madrasah, and Sherdor Madrasah) form part of the Registan ensemble, a collection of buildings in Samarkand's Registan Square. The Ulugbek Madrasa was constructed first (between 1417 and 1420), followed by the construction of the Ulugbek House (1424) across the square, the Mirzoyi Caravanserai (1430) to the north, the Alika Kokaldosh Juma Mosque (1420), and the wooden Khotamkori-style Muqatta and Abusaid mosques (1420) to the south. A madrasa was erected.

Yalangtosh Bahadir, the ruler of Samarkand, constructed the Tillakori madrasa mosque (1647–1660) in place of the crumbling Ulugbek home and the Sherdor Madrasa (1619–1636) in place of the Mirzoyi caravan-palace.

With its elaborately carved gable roofs and enormous domes, the Registan ensemble is a singular piece of Central Asian architecture and is adorned with multicolored tiles. Registan The Registan Square, where three madrasas were constructed, including the Ulugbek Madrasa (built between 1417 and 1420), Sherdor Madrasa (1619–1636), and Tillakori Madrasa, serves as the city's formal center (1647-1660).

Registan is one of the most well-known instances of the East's art of urban development and is home to historic scientific and educational organizations. Whoever doubts our might, let him come and see the buildings we erected, the Timurids bragged about him. The UNESCO included these three madrasahs to the World Heritage List in 2001. The city's historical hub for science, politics, and religion was Registan Square. "Registan" literally translates to "sandy area" [1].

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The square played a significant role in the Registan ensemble's construction, and it is clear that the buildings' breadth and height as well as the interior open courtyards were constructed using geometric principles and proportions. Samarkand Registan Ensemble is regarded as the most intricate ensemble as a result.

According to M.S. Bulatov [2; p. 58], the Samarkand Registan ensemble's Sherdor and Tillakori madrasas' area is 5:6. If the Registon region's width to height ratio is 6680:7840=0.85, the scientist's assessment is that the area is correct.

M. QAkhmedov claims that when designing architectural ensembles, they appeared to have paid attention to something else. The human eye's field of vision is 30 degrees up, 45 degrees down, and 65 degrees all around. A relatively minor portion of this cone is visible. Therefore, according to E. Bolieva, a specialist in the optics and physics of vision, what a person can perceive at a glance depends on how close or far away the objects in front of and to the sides of them are. According to him, the lower threshold is reached when the height of the structure is equal to half the distance from it. Contrarily, we investigated all the architectural ensembles of the "double" and "square" technique based on the principle that the more expansive the viewing angle, the more obviously the finiteness of existence is felt. Inspections reveal that the height of the structure is not larger than the distance in the middle of ensembles created using the "double" approach. Another amazing secret was made public. The lateral directions of the field of vision travel along the sides of the gable of the building where we are standing and, in our option, cover the whole width of the structure from behind the fence on the gable of each building, or from the center of the gable if there is no gable. This may be seen as double and square in all ensembles. For instance, the facade of Sherdar may be seen in Samarkand if one looks beyond the gate of the Ulughbek madrasa. Both its length and width are that. The Shahi Zinda mausoleums, the Khoji Abdul Khaliqi Gijduvani ensembles, the twin madrasa in Bukhara, the Madrasa Ulughbek and Abdulaziz Khan, among other structures, may also be studied using this methodology [3; p. 118].

Geometrical proportioning was crucial to the creation of Central Asian architectural ensembles and complexes, contributing to their harmony. M.Q. comes to the conclusion that observed buildings' characteristics are tailored to human eyesight. Akhmedov.

M.Q. In this article, we examine Akhmedov's assertion that the characteristics of observed structures are tailored to human eyesight. The facade of Sherdor is, in fact, concealed if we gaze beyond the fence from the Ulugbek madrasa in Samarkand; yet, for the building of Sherdor in connection to the Ulugbek madrasa, seeing with the eye (guessing) might be taken as one explanation. Because it is obvious that the Memoirs created Sherdor, sketched out the intermediate space, and then constructed it.

So let's focus on the Registon ensemble's memory coordination and proportional secrets. When examining the Registan ensemble in Samarkand, the Ulugbek madrasa, Sher Dor madrasa, and Tilla Kori madrasa and mosque are all situated in the western, eastern, and northern portions of the square, respectively. The exact measurements of the Registon area are 7140 cm in width and 7844 cm in height. The Ulugbek madrasa's inner yard now measures 3570 cm, or half of the main square, from the center to the outside wall (without the roof) in the direction of the main square. Consequently, the distance between the Ulugbek Madrasa's inner yard's center and its main square's center is equal to the width of the square. Since symmetry is achieved, the distance between the centers of the main square and the Sherdor madrasa is also 7140 cm. What is the ratio of the third madrasa, the Tillakori madrasa, and how are these three madrasas related to one another now that the combination of Ulugbek and Sherdor madrasas has been established?

For this, we draw longitudinal axes from the centers of the inner courtyards of the Ulugbek and Sherdor madrasas, and we draw a circle from the center of the field formed by the Ulugbek and Sherdor madrasas, passing through the centers of the towers on the west side of the Ulugbek madrasah. As a result, the longitudinal axes intersect the

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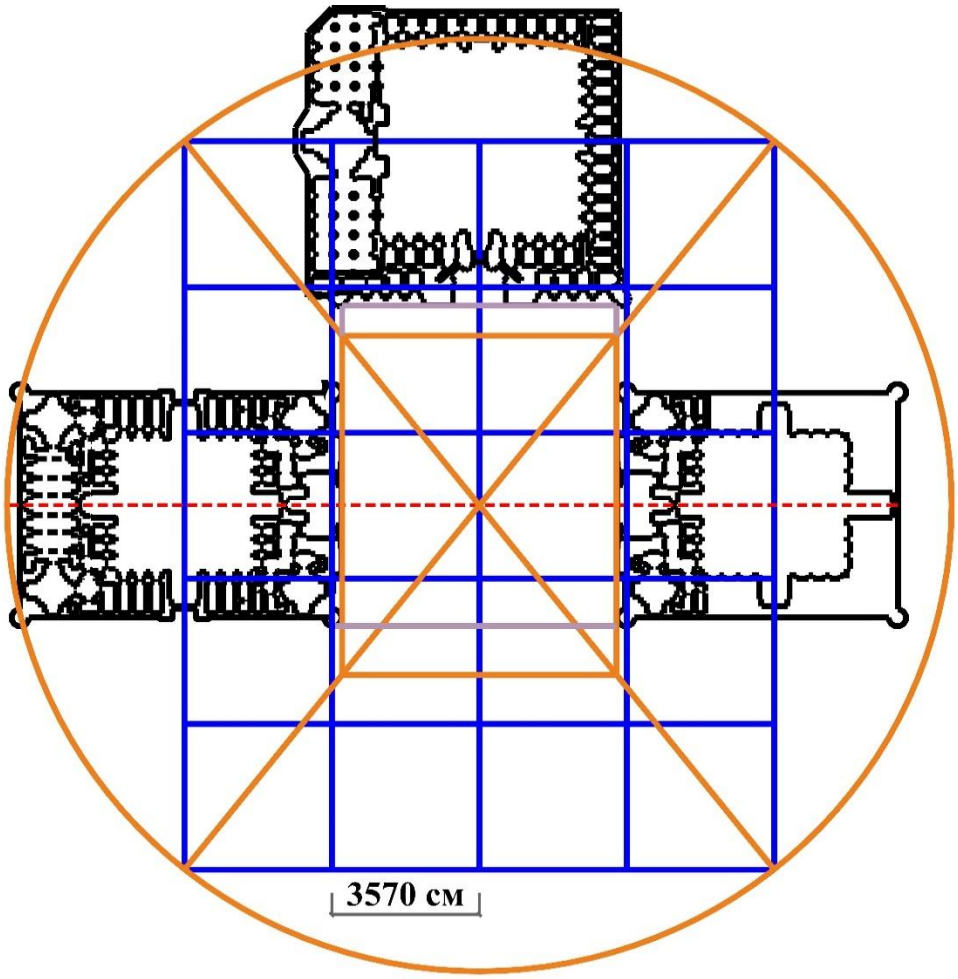
circle at four points, and if we connect two of these Notably, the inner courtyard of the Tillakori madrasa is cut in half by one edge of the resultant rectangle. The rectangle spanning these three madrasahs is 14281 cm wide and 17854 cm long. The width to height ratio of the resultant rectangle is equal to 14281:17854=0.8, or 4:5. The harmony and connection between these three madrasahs is 80% if this ratio is stated as a percentage ((4:5)x100=80%) (Figure 1).

We create a grid and add diagonals to the quadrangle by dividing this beautiful rectangle—which connects three madrasahs—into four portions of equal width and five portions of equal height. This grid makes it easier to see how the buildings relate to the central plaza. A square with a side length of 3570 cm and an area of 1274 m2 makes up each grid cell.

The ratio of the Registon area's surface to the surface of a grid cell is 5200:1274=4.08; the ratio of the Ulugbek madrasa's surface to the surface of the square is 4180:1274=3.28; the ratio of the Shedor madrasa's tarhi face and katakcha face is equal to 3680:1274=2.89; and the result is that the Tillakori madrasa's surface to the surface



1-расм. Самарқанд Регистон ансамбли тарҳининг ҳандасавий уйғунлашиш хусусиятлари. Тарҳда, 1М=297,5а га ва 297,5а=3570 см тенг бўлган модул тўри асосида таҳлил қилинган (Муаллиф чизмаси).

The ratio of the height of the main entrance gate of the Ulugbek madrasa to the side of one grid cell is 3590:3570=1, i.e. 1:1. The ratio of the height of the Ulugbek madrasa building to the side of one grid cell is

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1262:3570=0.35, i.e. 7:20. Also, the ratio of the width of this madrasa to the length of the main square is 5508:7848=0.7, that is, the ratio is 7:10.

Now, the ratio of the area of Ulugbek Madrasah to the area of Registon is 4180:5200=0.8, that is, it is in the ratio of 4:5, and it is equal to (80%) percent of the area of Registon. 3680:5200=0.7, or 7:10, or (70%) percent of the Registan area, is the ratio of the Sherdar madrasa area to the total area of Registan. The ratio of the Tillakori Madrasah's area to the Registan area is 5250:5200=1.009, or 1:1, and it is equivalent to (100%) percent of the Registan area's area.

The interior yard of the Tillkori madrasa is proportionate to the surface of Registan Square at 2275:5200=0.44, whereas the internal yard of the Ulugbek madrasa is proportionate to the surface of Registan Square at 1082:5200=0.2.

2-расм. Самарқанд Регистон ансамбли тарҳининг юзалари (Муаллиф чизмаси).

Similar to this, the ratio between the Sherdor and Ulugbek madrasa tarhi faces is 9:10. Ulugbek madrasa tarhi and Tillakori madrasa tarhi are compared in a 4:5 ratio, with 80% of Tillakori madrasa tarhi being equivalent to Ulugbek madrasa tarhi. 7:10 is the surface area ratio between Sherdor Madrasa and Tillakori Madrasa, and 70% of the surface area of Tillakori Madrasa is equal to the surface area of Sherdor Madrasa (Fig. 2).

The Sherdor and Tillakori madrasas were erected in connection to the Ulugbek madrasah, and the regulations of the Samarkand Registan Ensemble's memory integration have been validated. By using the aforementioned study techniques, it was determined that the buildings' relationship to one another was thoroughly established, and it was also demonstrated that this new finding had a geometric and mathematical foundation.

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