

Golden Ratio and the Meaning of the Wayang Kulit Gunungan Philosophy

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ABSTRACT

Mathematics is a field of science taught since elementary school that discusses patterns or regularities of mathematical concepts and mathematical structures. One of the privileges of mathematics is that mathematics is associated with culture, and one of the responsibilities of the citizens of Indonesia is to preserve its culture. The relationship between mathematics and civilization is known as ethnomathematics. In this case, the researcher takes the culture related to Cirebon wayang kulit. The problem researchers face is that there are no rules for making shadow puppet patterns except by plagiarizing. The wayang kulit taken in this study is the wayang kulit Gunungan Cirebon. However, the researchers took the concept of the Golden ratio as a material to overcome problems in creating patterns for wayang kulit Gunungan Cirebon. This research aims to: 1). Knowing the relationship of the golden ratio in making puppet patterns in Gunungan Cirebon. 2). Knowing the relationship between the golden ratio and the wayang kulit philosophy of Gunungan Cirebon. The research method is descriptive qualitative research with interviews, observation, documentation, and measurement data collection techniques. It also uses data analysis, data reduction, presentation, and concluding. The results of this study found that there was a relationship between the golden ratio and the making of wayang kulit patterns in Gunungan Cirebon. The application of the golden ratio in the making of shadow puppet patterns also contains philosophical meanings and symmetry in it.

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1. INTRODUCTION

One of the privileges of mathematics is that mathematics is associated with culture [1]–[3], and one of the responsibilities of the citizens of Indonesia is to preserve its culture. The two sciences between mathematics and culture are related to what is called

ethnomathematics. According to Hariastuti [4], ethnomathematics is a field that studies how humans from different cultures understand, pronounce and use concepts from their culture related to mathematics. According to another opinion, Astri Wahyuni [5] ethnomathematics can be defined as mathematics practised by cultural groups, such as urban and rural communities, labour groups, children of specific age groups, indigenous peoples, and others.

According to Pongtuluran [6], culture is one of the topics that attracts researchers from various disciplines of psychology, consumer behaviour marketing and other disciplines. Meanwhile, according to Nurkolis [7], culture is a view of life that is jointly recognized by a group of people which includes ways of thinking, behaviour, attitudes, and values reflected in both physical and abstract forms. Various kinds of culture in Indonesia must be preserved, one of which is wayang kulit.

Koesoemadinata [8] argues that wayang kulit is a traditional art that has long developed in Southeast Asia. In Indonesia, Malaysia and Thailand, in addition to local stories, wayang kulit presents stories from India, Ramayana and Mahabharata as a medium for teaching Hindu-Buddhist religion. Meanwhile, according to Fajrie [9], wayang is an original performing art from Indonesia that always tells the values, norms, traditions and culture that grow and develop in the lives of local people. The art of wayang kulit performances has long been known in the Southeast Asian region and is widely used for Islamic da'wah media by involving the role and influence of Sufi scholars and local rulers [10]–[13]. The formation and visual creation of wayang kulit were initiated directly by the guardians of sanga and subsequent Javanese kings. History proves that Cirebon shadow puppets (wayang kulit) are ancient and contain cultural acculturation (Javanese, Chinese) and Hindu-Buddhist Islamic beliefs (animism) [14]–[16]. Cirebon shadow puppets (wayang kulit) are evidence of the early development of Islam in Java. This traditional art has an ancestral heritage that should be preserved by the younger generation of Indonesia and must be preserved for the sake of love for Indonesian culture and a form of respect for the originators of the birth of wayang kulit. Wayang is one of the most famous Indonesian cultures among the existing cultures. In wayang culture, there are other cultures, namely sound art, music art, speech art, literary art, painting, sculpture, and symbolic art. The stories contained in wayang shows have meanings or symbols of life that aim to build the life of the nation and state.

One type of wayang in Indonesia is the Gunungan shadow puppet. The Gunungan shadow puppet is one of the components that must exist in a shadow puppet show that acts as an opening and closing story or performance [17]–[21]. In addition, the Gunungan shadow puppet has an exciting philosophy in its symbols, one of which tells the story of the beginning of life in the world. Creating works of art with good techniques will produce more exciting works and add artistic value, including strengthening their characteristics. One of the techniques in creating wayang kulit art or pattern making is to use the golden ratio theory.

The golden ratio is a science that uses specific calculations which are symbolized by the Greek symbol and has a value close to 1.618; it also often appears in the concepts of geometry, art, and architecture to the structure of living things and is applied in a pattern formation with the aim that the result of the pattern symmetrical, can reduce the error of making shadow puppets (wayang kulit), save time, can meet the demands of lovers related to the size of the shadow puppets (wayang kulit), and streamline the raw materials of leather.

In making a work of art, specific techniques are needed so that the resulting artwork contains a beautiful and exciting artistic value, following the expectations of the artists and fans of wayang kulit. However, in making leather puppets, there are many techniques used by shadow puppet artisans, including the technique of making patterns by using light (flashlights) and photocopiers. Therefore, this attracts the attention of researchers so that researchers plan to research matters related to making wayang kulit patterns using the golden ratio theory in the hope that this research can give birth to innovation in the process of making shadow puppets (wayang kulit) that are created according to what is intended. wanted by artisans and lovers of wayang kulit.

2. METHOD

The type of research used in this research is descriptive qualitative. According to Creswell [22], qualitative descriptive is a qualitative depiction of facts, data, or material objects that are not in the form of a series of numbers but in the form of language expressions or discourses (whatever their form is) through appropriate and systematic interpretation. The target of this research in the mathematical aspect is using the concept of the Golden ratio for making patterns for wayang kulit gunungan. The analysis of the process of making this wayang kulit pattern is still using the artist's ideas or tracing the pattern of wayang kulit that has already been formed.

Sources of data used in this study are primary data sources and secondary data sources. The primary data source is the first data source. It is from the subject or object of research that direct research data is taken, such as visual data in the form of patterns of shadow puppets (wayang kulit) that have been formed previously, then traced on a paper medium. In addition, other primary data sources needed are written data from interviews with direct sources who know about shadow puppet objects and how to make them.

While secondary data is a source of secondary data is data source that does not directly provide data to researchers, such as documents or through other people's intermediaries. Researchers took data through source books, articles, and writings related to ethnomathematics, namely the manufacture of shadow puppets (wayang kulit) with the science of the golden ratio, the field of geometry, and psychologists of flat shapes, to complete the data with relevant literature studies. Secondary data sources can be taken from any party who can provide additional data to complement the shortcomings of the data obtained through primary data sources. The data was obtained through Interviews, Observation, and Documentation.

3. RESULTS AND DISCUSSION

3.1. Gunungan Leather Puppet

Gunungan in performances or performances of wayang kulit purwa has a vital role; from the beginning (talun) to the end of the show (tancep kayon), always use gunungan. The shape of the mountain (Gunungan) is very distinctive, so it is easy to recognize and memorize the shape of a tapered mountain, such as a cone or mountain. Gunungan is also called kayon because the central element in the gunungan is the image of a tree (intelligence or wood), who called "mountains" because of their shape like a pointed mountain peak [23]–[25].



Figure 1. Wayang Gunungan

According to Ciptowardoyo [26], kayon means life through death or life in the mortal realm. Kayon can be equated with the kalpataru tree or the tree of hope; it can also be called a hill or mountain, which symbolizes the source of life and livelihood as the word *gunungan* stops means the world is silent. Meanwhile, according to Stutteheim in Sastraomidjojo [27], the meaning of wayang *gunungan* is the symbol of Mount Mahameru, the heaven where the gods live the centre of life.

A Socio-Criminological novel by Jatmika [28] states that the *gunungan* in Javanese wayang is often called Kayon because, in the middle, wood is still alive as a symbol of pristine nature. It is said that the term wood or kayon comes from the Arabic *hayyun*, which means life. On the back side of the mountain, there is a picture of a sea of blazing fire which in the Javanese code chronology means Dahana Murub Rayahinung Bawana or designed in 1433 Caka to coincide with 1512 AD.

Visually, it is explained that the *gunungan* is the centre of the Pakliran, the shape of an equilateral triangle, the stylization of the shape of Mount Mahameru, the main contents of which are the shapes of trees and hills. Traced from its name, *gunungan* also means *gegunung* or *tetunggal*, which means the most important or the most powerful. As already mentioned, *gunungan* is a symbol of life, so every picture in it symbolizes the entire universe and its contents, from humans to animals and forests and their equipment.

The function of the *Gunungan* shadow puppet in every wayang performance, both wayang *golek* and wayang *kulit* always begins and ends with the appearance of the *gunungan*. According to Ciptowardoyo [26], the function of the *gunungan* is 3, namely 1) it is used in opening and closing, just as the screen is opened and closed in a play. 2). As a sign for a line change (scene or act). 3). Used to describe trees, wind, ocean, mountains, thunder, and lightning.

3.2. Philosophy of Wayang Gunungan Cirebon

According to Ki Dalang H. Mansur, to identify the essence of the shape of the mountain is from the shape of the leaves. There are three types of leaves in *Gunungan Cirebon*, namely: *Tumpengan Model*, *Godong Kluwian Model*, and *Godong Weringin Model*. From the three models, it developed into dozens of models of mountains. Apart from departing from the three-leaf models, three elements should not be absent in the composition of the Cirebon mountains. The three elements are:

- Birds as upper animals symbolize the nature of the sea (divine realm).
-

- The elephant (Ganesha) is the middle animal that symbolizes the nature of malakut (the realm of the Angels, Prophets, Guardians and the righteous).
- Dragon (snake), an animal that symbolizes the nature of nasut (human nature).

According to Ki Dalang Emo, Gunungan Cirebon is a solar trumpet or a symbol of the solar year calendar (solar system) and lunar year calendar (lunar system), so that the appearance of the colouring of the face of the mountain with the opposite face is not the same. The front face represents the year of the moon's cycle (qomariyah system), while the reverse face represents the sun's cycle (syamsiyah system). Therefore, it is not strange if the mountains of Ki Dalang Emo are presented with the kemangmang model, which symbolizes the sun, although the face of the mountains, on the other hand, still uses conventional motifs. The choice is related to the calendar system, so according to Ki Dalang Emo, the Gunungan elements must consist of:

- Naga Dina (day character)
- Naga Wulan (moon character)
- Naga Tahun (year character)

Another element that is the most prominent characteristic in Gunungan Cirebon is the Ganesha motif. In Cirebon the Ganesha motif is called lindu or lindu angel. Angel Lindu is an angel who is believed by the Cirebon puppeteer community as an angel who lifts the earth of the pitu lan seisine (seven layers of earth and all its inhabitants). As a result, Angel Lindu is also known as Sanggabuana. Regarding the Angel Lindu, the Fiber Tapal Adam script written by R. Syarief Rohani Kusuma Wijaya, said that:

“perlu dicaturaken malih// ana ing sudasaring bumi pertala// Dipun sangga dening Malaikat// gede brangas gagah galak// kuat nyangga bumi lapis pitu// iku numpang ana ing pucuke sungu// Malaikat kang gagah perkasa.” (It needs to be told again, it is at the bottom of the earth, lifted by an angel, big, cruel, strong, fierce, strong to lift the earth seven layers, above the horns, a mighty angel).

Mitologi Malaikat Lindu atau Ki Buyut Lindu Buwana atau Sanggahabuwana jelas tercatat dalam tradisi lisan maupun tradisi keberaksaraan, sehingga cukup beralasan apabila tampilan Malaikat Lindu dalam gunungan jenis ini cukup menonjol. Hampir seluruh Janturan gunungan yang dimiliki dalang Cirebon adalah terdiri dari mode seperti ini.

The janturan gunungan belonging to the amulet box of the Kesepuhan Palace is different from the gunungan owned by the Cirebon puppeteers. Ki Sawiya's Gunungan

model is called the Indrakilaan Mountain model. Why is it called that? Because the ornaments that dominate this mountain are made up of leaves and insight that make up Mount Indrakila. The tree ornaments are different from other trees commonly used in the mountains. Usually, the tree ornaments are straight, but in Gunungan Indraki it is *luklukan* (has several curves). According to Emong Sukirman, the Gunungan Indrakila model is used for plays related to asceticism or to describe forests (*wana*).

Janturan Gunung is a philosophy of the existence of God. As stated in the puppet mastery of the Sultanate of Kanoman I, "Wayang gunungan (*kayon*) is seen from the special understanding of gunungan; the basic word "mountain" means *agung lan gumunung*, that is sublime and noble. Then *kayon* comes from Arabic, the word "hayyun", which means the Living One. In this context, the sublime and noble and the Most Alive is Allah SWT. So wayang gunungan or *kayon* symbolizes the existence of the Creator." [29].

Janturan gunungan is placed next to a knight, or a daughter or a *jabang* is open. The answer is to show the relationship between humans and God or "Hablum minallah wa hablum minannas", or it can also be interpreted as a place where humans must return to Allah SWT. "Inna lillahi wa inna ilaihi rajiun" or in the teachings of Sufism *wihdatul form* (mystic union) as a process of uniting with God "manunggal ing kawula gusti" according to [30].

3.3. Gunungan Shadow Puppet Making

The process of making wayang kulit is challenging, requiring precision and patience. Accuracy is required from the first time the puppet pattern is made. The exact size and type of puppet to be made will be beneficial in the following process. The slightest form of mistakes in making puppets is avoided, especially in the process of carving or carving the skin.

In addition to accuracy and patience, skills are also needed to produce shadow puppet work. The skill of a wayang stylist can be obtained by diligently undergoing the process of making wayang kulit continuously. The technical quality produced by a wayang stylist highly depends on the length of experience the stylist has engaged. In addition, of course, talent is also very supportive in the process of making puppets.

The method of making wayang patterns in Cirebon is by tracing the previous puppets. Apart from plagiarizing, it is considered not justified by the standard. Because according to practitioners of wayang in Cirebon, wayang is a noble work of the guardians, especially Sunan Kalijaga. Plagiarizing means preserving or preserving the masterpiece so that the

wayang procedures and sizes must be appropriate. After the plagiarism fits, we are also allowed to make variations or beautify the work by inlaying or displaying it [30].

3.4. The Role of the Golden Ratio on the Gunungan Shadow Puppet

In general, the gunungan shadow puppets (wayang kulit) can be divided into three parts, pay attention to the picture below:



Figure 2. Golden ratio in Gunungan shadow puppets (wayang kulit)

From figure 2 above, it can be seen that the gunungan shadow puppets (wayang kulit) can be divided into three parts, namely P1 (The complete pattern of the Gunungan Cirebon shadow puppet pattern), P2 (the pattern of the peak of the gunungan or triangular shape), and P3 (the pattern under the peak of the gunungan or square).

Pay attention to the figure below, which is the overall wayang gunungan or P1.



Figure 3. Golden rectangle wayang kulit gunungan

To determine the results of the golden ratio in the first application (P1), a comparison formula is used, namely $\phi = \frac{a}{b}$ with $a = 10.21$ and $b = 6.29$. So, (P1) $\phi = 1.623$. It should be noted that the value of the golden ratio is 1.618. This means that the first application (P1) has a value of 1.620 (close to) and has a difference of -0.005 (maximum)

from the golden ratio. This means that the Gunungan shadow puppet has a beauty value because it has a proportion close to the golden ratio.

From the results of the golden ratio in figure 3 above, by applying the golden rectangle, two applications are produced, namely P2 and P3. As for the philosophy of the Gunungan Cirebon shadow puppets (wayang kulit), according to R. Hasyim [30] in the quote from Ki Dalang H. Mansur, to see the essence of the form of the Gunungan Cirebon shadow puppets (wayang kulit) is to look at the leaves. There are three types of leaves in the Gunungan Cirebon shadow puppets (wayang kulit): the Tumpengan Model, the Godong Kluwian Model, and the Godeng Weringin Model. The three types of leaves then develop into several types of leaves. According to Ki Dalang H. Mansur, there are three components that characterize the Gunungan Cirebon shadow puppets (wayang kulit), namely the bird as the upper animal, which symbolizes the nature of the sea (divine nature), which is found in the second application (P2). Elephant (Ganesha) is the middle animal which symbolizes the malakut realm (the realm of the Angels, Nai, Guardians, and the Shalihin) and the Dragon (Snake), the lower animal which symbolizes the nasut realm (human realm). The Elephant (Ganesha) and Naga (Snake) components are found in the third application (P3).

In P2, two golden triangles reflect each other. Look at the following figures:

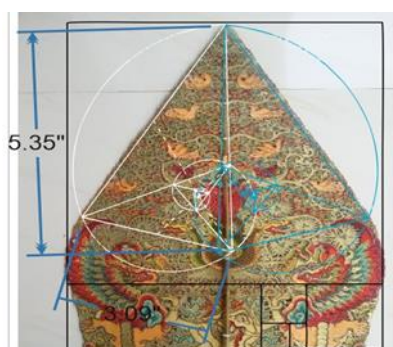


Figure 4. Golden rectangle P2

As for determining the results of the golden ratio in P2, it uses the ratio formula, namely $\phi = \frac{a}{b}$, with $a = 5.35$ mm and $b = 3.09$ mm. So, (P2) $\phi = 1.731$. Please note that the value in the golden ratio is 1.618. This means that the second application (P2) has a value of 1.731 (close to) and has a difference of -0.113 (maximum) for the determination of the golden ratio.

The second application (P2) there is the initial meaning of life in the world which is depicted by the symbol of a tree or forest in which there are several animals, namely tigers, bulls, monkeys, peacocks, and so on. This means a philosophy that the beginning of life in

the world begins with life in the wilderness. In this P2, the first step is to determine the relationship between the golden ratio and the formation of the Gunungan Cirebon shadow puppet pattern, related to the symmetry of the pattern to produce aesthetics for the puppet artisans to apply two opposite golden triangle shapes. Then draw the lines on the two golden spirals to form a triangle. This application will produce a symmetrical pattern on the top of the Gunungan Cirebon wayang kulit. In addition, the symbols of the Gunungan Cirebon shadow puppets (wayang kulit) can also be produced, which form a reflection.

For P3 analysis, consider the following figure:

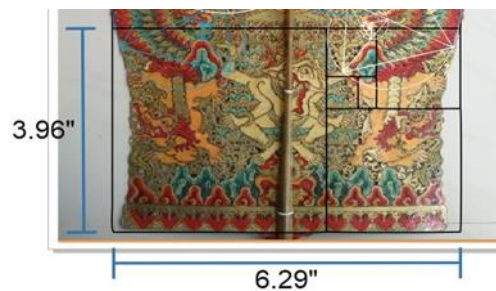


Figure 5. Golden Rectangle P3

To determine the results of the golden ratio in the third application (P3), the ratio formula is used, namely $\phi = \frac{a}{b}$, with $a = 6.29$ mm and $b = 3.96$ mm. So, (P3) $\phi = \frac{a}{b} = 1.588$. Please note that the value in the golden ratio is 1.618. This means that the third application (P3) has a value of 1.588 (close to) and has a difference of 0.03 (minimum) from the golden ratio.

In P3, this describes human life in which there is a symbol of a gate or gate that enters a joglo house, then on the right and two giant fangs guard left sides. This is interpreted as life = humans who, if they sin, will enter the gates of hell in which there is a very cruel torment. In addition, in the centre, there is Ganesha, the Hindu god of knowledge, who raised the double-winged kendaga of the figure of Lindu Anyangga Bumi. This is interpreted as the obligation of humankind to uphold science. In addition, knowledge is a buffer or support for the world; at the bottom of Ganesha, there is Banaspati, the guardian of the environment. This is interpreted as the obligation of humankind to preserve the universe and everything in it.

From the analysis of the gunungan shadow puppets (wayang kulit) above, it can be concluded that the use of the golden ratio, in addition to obtaining beautiful and symmetrical puppets, can also obtain part of the detailed symbols contained in the puppets.

In addition, this golden ratio can streamline raw materials with a specific size scale and can be used to scale the desired size of the puppet..

4. CONCLUSION

Based on the background of the problem in the previous section, the researcher concludes that the making of the Gunungan Cirebon wayang kulit pattern can use the golden ratio theory technique, which previously used flashlights and photocopiers because it can overcome the increase in consumers. Demands. Lots. In addition, based on the description and analysis of the data that has been obtained, as well as the discussion and results, it can be concluded that in the application of the golden ratio in the making of the Gunungan Cirebon shadow puppet pattern, various forms obtained the golden ratio, namely the golden rectangle as the basis for making the Gunungan Cirebon shadow puppet pattern and to form mountain peaks and indentations in the coils. In addition, applying the golden ratio in making shadow puppet patterns can reduce errors in making leather puppets and increase or decrease the size depending on consumer demand.

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