Golden Ratio and Its Effect on Handwritings Using Golden Line

Vishvesh Lalji Solanki

Abstract— **The handwriting we write weather is good or bad have large impact on our life as well as in our academics. Some have synchronized or some have very irregular hand writing. Is the art of good handwriting is like something by birth skill? Answer to this question is no. In this very advance world there is no such skill one cannot master .If you do it with all your effort put in right way. And most important is to do naturally. By using the natural laws, one can master any skill. By this way your mastered skill will not only last for long but also it will be appealing for one who witness it. In this way our hand writing is also the skill, one can master easily. With very limited resource. Just a paper and pen is required. After all our hand writing make lot of impact on our life as well as study. Good handwriting is a sign of good education. This paper is about four parallel lines drawn in such a way that it's satisfied golden ratio (1.618) or golden mean. After practicing writing skill on that four parallel line. How one can write better than before and how good writing last long after time, this paper of just four parallel lines will influence everyone who goes through the process called education. The main goal of this paper is to provide easily way to the writer who wanted to make his handwriting good by means of golden line.**
This is a paper of engineering in which a ratio is used to increase the aesthetic quality of the handwriting. It's this paper also show how golden ratio is presented in the world we live and many natural objects.

Index Terms — **golden ratio, golden line.**

I. INTRODUCTION

Golden lines are four parallel lines drawn by using proportion called golden ratio [1] or golden mean. Golden ratio is an irrational number equal to 1.6180339887... . The golden ratio is also called the golden section (Latin: *sectio aurea*) or golden mean. Other names include extreme and mean ratio, medial section, divine proportion, divine section , golden proportion, golden cut, and golden number. The golden ratio has also been used to analyze the proportions of natural objects as well as man-made systems such as financial markets, in some cases based on dubious fits to data [2]. The main reason behind using the golden ratio to make golden lines is to make our handwriting perfectly fits to its ratio which is believed to be aesthetically pleasing. And after practicing on golden line the good writing will last long. We all have practiced our hand writing on four line paper, when

Vishvesh Solanki, Mechanical Department, Noble Group of Institution, Junagadh, India

we were in our initial grade Which are four line drawn equal distances to each other . But after time we leave practicing, Writing becomes irregular. And there is no sense to practice on those four equal distance line, as we know the result, every one of us have gone to that process but what happen to our writing! it is still not so impressive even we have invest our lots of time in practicing those four line books. Now it's time to change because golden lines have many advantages over it, good handwriting have many advantages like increase brain activation, impact performance across all academic subjects [3].

"It seems there is something really important about manually manipulating and drawing out two-dimensional things we see all the time," says Karin Harman James, (assistant professor of psychology and neuroscience at Indiana University)

In order to master the skill of handwritings golden line plays vital role, And our handwriting have large impact on our brain , as above said and writings following golden ratio will surely effect the in pattern of our writing .

The golden ratio has fascinated Western intellectuals of diverse interests for at least 2,400 years. According to Mario Livio: Some of the greatest mathematical minds of all ages, From Pythagoras and Euclid in ancient Greece, through the medieval Italian mathematician Leonardo of Pisa and the Renaissance astronomer Johannes Kepler, to present-day scientific figures such as Oxford physicist Roger Penrose, have spent endless hours over this simple ratio and its properties. But the fascination with the Golden Ratio is not confined just to mathematicians. Biologists, artists, musicians, historians, architects, psychologists, and even mystics have pondered and debated the basis of its ubiquity and appeal. In fact, it is probably fair to say that the Golden Ratio has inspired thinkers of all disciplines like no other number in the history of mathematics [4] and I believe that this ratio will also help us to improve our handwriting by using golden lines. These golden lines have strong foundation of its construction. Unlike the traditional four lines .As this are drawn by the golden proportion.

II. LITERATURE REVIEW

While the proportion called golden mean has always existed in physical universe and mathematics it is still unknown when it was discovered and applied by mankind .it is assume that it has perhaps been discovered and rediscovered throughout history, and practice in deferent culture by several.
Phidias (500 BC – 432 BC), a Greek mathematician and sculptor, studied phi and applied it to the design of sculptures for the Parthenon. After Phidias ,Plato (428 BC – 347 BC) in his views on natural cosmology and science presented in his

"Timaeus," considered the golden section to be the most significant of all mathematical relationships and the key to the physics of the cosmos. Euclid found (365 BC-300 BC) in "Elements," referred to dividing a line at the 0.618039.. Point as "dividing a line in the extreme and mean ratio." This later he use the term mean in the golden mean. He also used this number to the construction of a pentagram. Leonardo Fibonacci, discovered the unusual properties of the numerical series that now bears his name, but it's not certain that he even realized its connection to phi and the Golden Mean. His notable contribution to mathematics was a work known as "Liber Abaci" Leonardo Da Vinci provided illustrations for a dissertation published by Luca Pacioli in 1509 entitled "De Divina Proportione" , perhaps the earliest reference in literature to another of its names, the "Divine Proportion." This book consist drawings made by Leonardo da Vinci of the five Platonic solids. Leonardo Da Vinci, used it to define all the fundamental proportions of his painting of "The Last Supper," Johannes Kepler (1571-1630), also mention "Divine Proportion [5]," by saying:

"Geometry has two great treasures: one is the theorem of Pythagoras; the other, the division of a line into extreme and mean ratio. The first we may compare to a measure of gold; the second we may name a precious jewel."

It is believed that Martin Ohm (1792–1872) was the first person to use the term "golden" to describe the golden ratio. to use the term. In 1815, he published "Die reine Elementar-Mathematik" (The Pure Elementary Mathematics) It wasn't until the 1900's that American mathematician Mark Barr used the Greek letter phi (Φ) to designate this proportion. This appeared in the "The Curves of Life" [6] in 1914 by Theodore Andrea Cook. By this time this proportion was known as the golden section, golden mean and golden ratio as well as the Divine proportion. Golden ratio continues to open new possibility in our understanding of life and the universe. It was mention in Roger Penrose's discovery in the 1970's of "Penrose Tiles," which first allowed surfaces to be tiled in five-fold symmetry. It appeared again in the 1980's in quasi-crystals, a newly discovered form of matter. The description of this proportion as golden and Divine is fitting perhaps because it is seen by many to open the door to a deeper understanding of beauty in life. That's an incredible role for a single number to play, but this one number has played an incredible role in human history and in the universe at large. *"The laws of beauty were equated with the laws of nature; beautiful design had to rely on the principles of natural beauty"* Kruft [7], , From above historical analysis golden ratio is used in nature creation the best Method to apply nature s laws to our product design is golden ratio, and it will also effect on aesthetic quality of the product.

Golden ratio and Luca Pacioli, published a three-volume treatise on the Golden Ratio in 1509 Titled *Divina Proportione*. [8]The ratio of the dimensions of Dali's painting *Sacrament of the Last Supper* is equal to the Golden Ratio. Dali also incorporated in the painting a huge dodecahedron a twelve-faced Platonic solid in which each side is a pentagon.

The famous Swiss-French architect and painter Le Corbusier, for example, designed an entire proportional system called the "Modulor," that was based on the Golden Ratio. Relationship between the human perception of "beauty" and mathematic the attempts to answer this question have led to a long series of psychological experiments, designed to investigate a potential they found golden ratio tool to improve aesthetic quality of the product.

The pioneering experiment in this field were conducted by the German psychologist and physicist Gustav Theodor Fechner in the 1860.they took ten rectangles deferent in their length-to-width ratios were placed in front of a public , who was asked to select the most aesthetically pleasing one. The results showed that 76% of all choices cantered on the three rectangles having ratios of1.50, 1.62 and 1.75, with a peak at the "Golden Rectangle" (with ratio 1.62). Fechner went further and measured the dimensions of thousands of rectangular-shaped objects (windows, picture frames in the museums, books in the library), and claimed his book *Vorschule der Aesthetik* [9] to have found the average ratio to be close to the Golden Ratio.

According To Report Of "The Times Of India" [10] *Mumbai Physicists Uncover Link Between Lord Shiva, Mona Lisa,* They Found The Common Link Between Mona Lisa And Lord Shiva Is The Golden Ratio. A Study By Physicists Vijay Singh And Praveen Pathak From The Homi Bhabha Centre For Science Education Has Found Link Between Lord Shiva And Mona Lisa.

In spite of the Golden Ratio's truly amazing mathematical properties, and its propensity to pop up where least expected in natural phenomena, It is believe that we should consider its application as some sort of universal standard for "beauty," either in the human face or in the arts.

The above literature shows how golden ratio is used in the work of some famous artist, which results in improvement in aesthetic quality by using golden ratio.

According to report of "Mail Online" [11] *Is space-time shaped like a SPIRAL? Universe has a 'golden ratio' that keeps everything in order, researchers claim.* They claim that our universe have golden ratio. They also clam that. according to evolutionnews.org The curl of an elephant tusk ,The shape of a kudu's horn ,Hurricane spirals ,The distribution of planets in the solar system ,A biological species constant, T, The spiral structure of the cochlea ear-bone in a fossil hominine, The logarithmic spirals of galaxies [9]The structure of DNA The growth of many plants (phyllotaxis),The Periodic Table of the Elements, Spiral shells of certain mollusks, like snails Spiral shells of living and extinct ammonites ,Stress patterns in nanomaterials ,The stability of atomic nuclides ,The topology of space-time.

Why so many smart folks have become absolutely obsessed with golden ratio the uses the golden ratio has fascinated the world's most knowledgeable people for millennia since its discovery and we have seen its influence in some of the finest

works mankind has ever produced Plato's study into the golden ratio was used in the designs of the Parthenon shown in (**fig 7**) the Egyptians pyramid (**fig 1**) displayed it in the planning and construction of the pyramids and the likes of the Taj Mahal (**fig 8**)Notre Dame and the Great Mosque of care who odd were also built according to this important mathematical law artists from da Vinci to Dali also incorporated the golden ratio in the layout of their paintings about is whether any or all of this was deliberate modern artists and architects know about the golden ratio and are known to apply it purposefully to their works and we know that at least some historical buildings and artworks were created by people who knew of the golden ratio and its value but this inexplicably pleasing proportion has been used by people ignorant of its existence too so is the golden ratio merely something which all human beings are attracted to is it something that we find inherently satisfying and is this love of the number 1.618 for limited only to humans and at number one nature's design is the golden ratio a universal law applied by nature the evidence seems to suggest so and the aforementioned Leonardo da Vinci may have alluded to this and some of his most famous works D Divina purportsione was a mathematical textbook illustrated by da Vinci in 1498 and in both this and his drawing of the Vitruvian Man (**fig 3**) the points out examples of the golden ratio found within the human body psychologists have also noted that people whose facial body and bone structures adhere to the golden ratio are often deemed to be more attractive than their non-proportional counterparts and if you'd like to pause the video to go measure your face right now we totally understand but you might want to hold on a second because the most shocking example of the golden ratio within human beings is far more interesting did you know that the golden ratio even applies to our DNA (**fig 4**) The DNA molecule measures 34 angstroms long by 21 angstroms wide for each full cycle of its double helix spiral. These numbers, 34 and 21, are numbers in the Fibonacci series, and their ratio 1.6190476 closely approximates Phi, 1.6180339. This takes on the form of a spiral. Its call the logarithmic spiral, and it abounds in nature shell (**fig no 5**) some fish (**fig no 6**) have the eye, fins and tail all fall at Golden Sections.
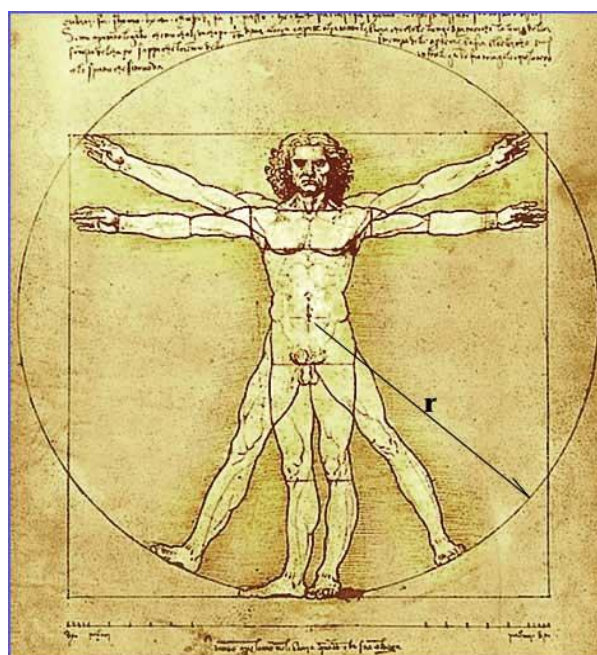

Figure 2: The Sacrament of the Last Supper [12]
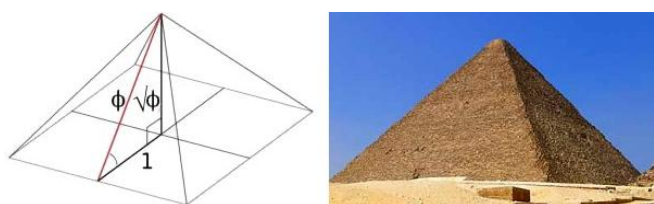

Figure 3: Vitruvian Man [13]
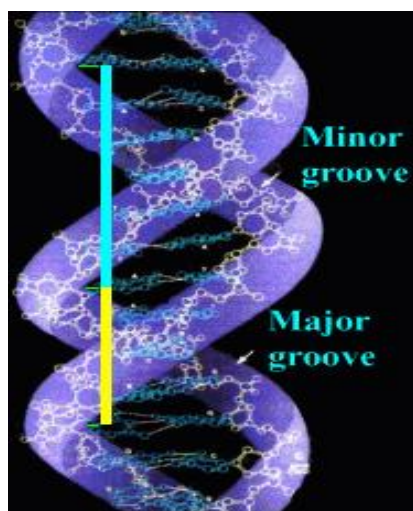

Figure 1: The pyramid of Giza [12]

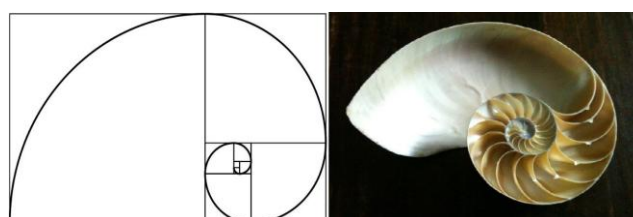**Figure 4: DNA structure [14]**

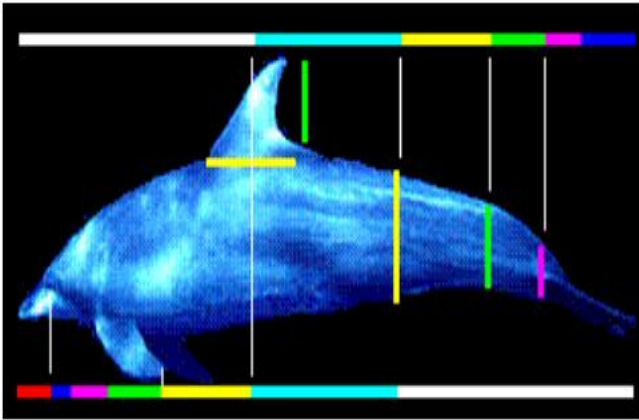**Figure 5: Shell structure [15]**

Figure 6: Dolphin body Shell structure [16] (the eye, fins and tail all fall at Golden Sections)
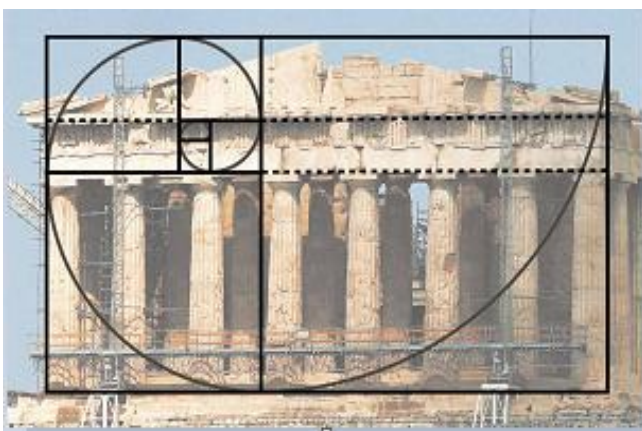

Figure 7: Parthenon [17]

Figure 8: Taj Mahal [18]

Above literature shown that how golden ration is present in many design. Man made as well as natures design. In further work we will applied to product design and improve aesthetic quality.

Construction of Golden lines

Golden lines are four parallel lines drawn by using golden ratio which is approximately 1.618.

- Draw a line horizontal line thought the paper.
- Draw a another line parallel to that line of width as our required as per our writings.

- Now divide the breath by 1.618 the answer is again divided by 2. the final result is use to draw another parallel line between this to line.
- Now the answer is suppose (a) then draw a parallel line from measuring the top line.
- And another parallel line is drawn from the bottom line with measurement (a) again
- Now by measuring distance between two parallel lines which are in center (2nd and 3rd) line the distance be (b) and the ratio of b/a is 1.618.
- And the four resultant lines are called golden lines and the sets of another golden line can be drawn by taking ratio of width of golden line be c. again dividing the line by golden ratio And the answer is d suppose then it is the distance between two golden lines. likewise line is drawn thought the paper for practicing handwritings
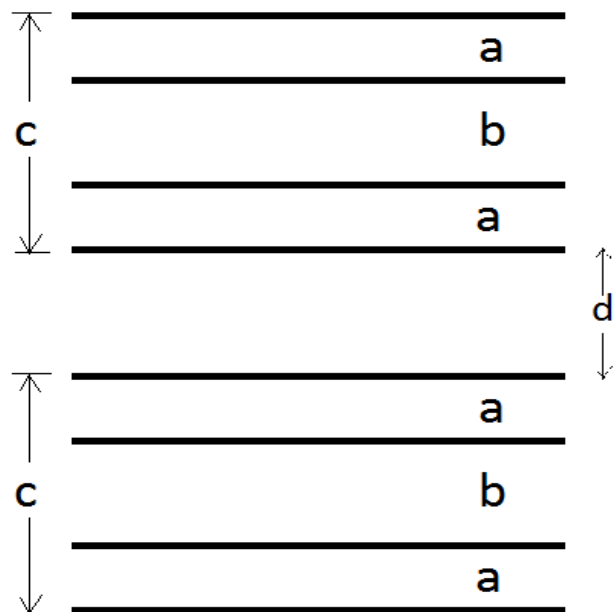

Figure 9 showing two sets of the golden lines

Above lines shown in fig: 3 are known as golden lines and this line are drawn in sheet bellow shown in fig: 4 and this can use in practicing writing, by practicing in it will not only improve handwriting but also it will last long with time. And can be introduced to lower grade. And it should replace tradition four line paper (or handwriting practicing sheet) which has no foundation; they are just trace at equal distance. Bellow given paper is made by sets of golden lines, and this paper can be used to practice the handwriting.
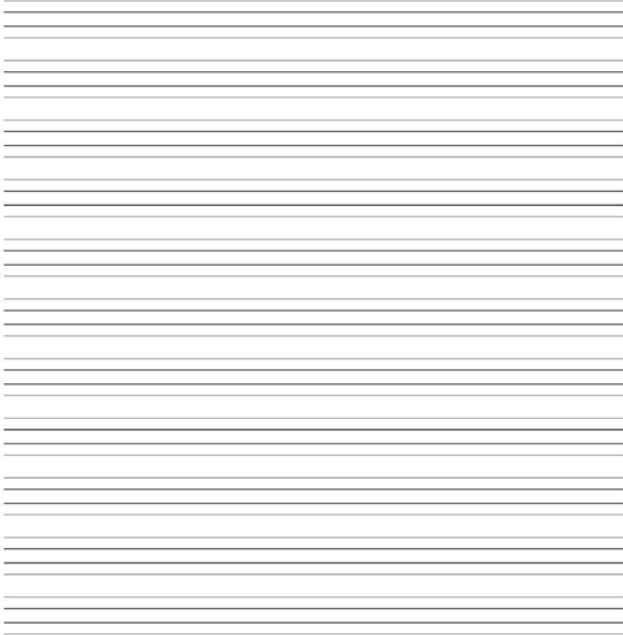
[12] "GoldenNumber.net," Golden Ratio in Art Composition and Design, [Online]. Available: https://www.goldennumber.net/art-composition-design/.

[13] T. Ida, ""Vitruvian Man" by Leonardo da Vinci and the Golden Ratio," [Online]. Available: http://www.crl.nitech.ac.jp/~ida/education/VitruvianMan/.

[14] "gnosticwarrior.com," [Online]. Available: https://gnosticwarrior.com/golden-ratio-phi-humans-dna.html.

[15] g. divorsky, "io9.gizmodo.com," [Online]. Available: https://io9.gizmodo.com/5985588/15-uncanny-examples-of-the-golden-ratio-in-nature.

[16] G. Dvorsky, "io9.gizmodo.com," 2 20 2013. [Online]. Available: https://io9.gizmodo.com/5985588/15-uncanny-examples-of-the-golden-ratio-in-nature.

[17] "www.goldennumber.net," [Online]. Available: https://www.goldennumber.net/parthenon-phi-golden-ratio/.

[18] "Fun with Fibonacci," [Online]. Available: https://sites.google.com/site/funwithfibonacci/architecture/the-taj-mahal.

[19] "scribblers.co.uk," [Online]. Available: http://www.scribblers.co.uk.

[20] L. a. M. C. S. a. F. Sigalotti, "The golden ratio in special relativity," vol. 30, pp. 521-524, 2006.

Vishvesh Solanki, Mechanical Department, Noble Group of Institution, Junagadh, India

Figure 10 sheet [19] which contain sets of golden line

III. CONCLUSION

The whole sheet made up of several sets of golden line can be used in practicing the handwriting skill, which have many advantage over traditional sheet used in practicing handwriting skill. Traditional sheet is made by four parallel lines drawn at equal distance. But golden lines are based on golden ratio which is believed to be naturally fit and aesthetically appealing. Hence by using it in our handwritings will not only improve our handwriting but it will be last long after leaving the practice of golden lines. If this sheet introduced in earlier grade then the student in early grade will be habitual of this format. This will add a new chapter in mastering handwriting skill. After all,

REFERENCES

[1] R. S. Omotehinwa T. O, "Fibonacci Numbers and Golden Ratio in Mathematics and science," International Journal of Computer and Information Technology, pp. 630-638, july 2013.

[2] S. (. 2. 2. Strogatz, "Me, Myself, and Math: Proportion Control", NY: New York Times, September 24, 2012.

[3] M. Livio, in The Story of Phi, The World's Most Astonishing Number, new york, BROADWAY BOOKS, p. 6.

[4] J. Heiberg, "Euclid's Elements of Geometry," Richard Fitzpatrick, December 31, 2007.

[5] H. E. Huntley, "The Divine Proportion : A Study in Mathematical Beauty by," p. 158.

[6] T. A. Cook, in The curves of life, 1914, p. 420.

[7] Kruft, " A History of Architectural Theory: From Vitruvius to the Present," New York., Zwemmer and Princeton Architectural Press, 1994.

[8] L. Pacioli, "Divina Proportione," treatise on the Golden Ratio, vol. 3, 1509.

[9] G. Fechner, Vorschule der Aesthetik, 1876.

[10] H. Chhapial, times of india, 10 Jul 2016, 16:00 IST. [Online]. Available: https://timesofindia.indiatimes.com/city/mumbai/Mumbai-physicists-uncover-link-between-Lord-Shiva-Mona-Lisa/articleshow/53136104.cms.

[11] "Mail online," 5 December 2014. [Online]. Available: http://www.dailymail.co.uk/sciencetech/article-2862243/Is-space-time-shaped-like-SPIRAL-Universe-golden-ratio-keeps-order-researchers-claim.html.