Verbogeometry
The Confluence Of Words And Analytic Geometry

Kaz Maslanka
Mathematical Poet
San Diego, CA, 91914, USA
E-mail: kaz@kazmaslanka.com

Abstract

Verbogeometry is a form of art which is interested in creating an aesthetic experience with poetic structures of mathematical / verbal metaphors. I am introducing Verbogeometry as a subset of a small movement of mathematical poetry occurring globally but mostly in America and Finland. This particular mathematical poetry movement has some connections to the visual poetry movement in the English speaking world. This paper on Verbogeometry is a primer and also an ongoing investigation.

The Mechanics of Verbogeometry:

1. Word-Axes and Word-Planes. One of the tenets of Verbogeometry and Mathematical poetry is that one performs mathematical operations on values of quality as if they were quantity. Of course this seems to be nonsense but then one must realizes that *paradox is the mathematical structure of metaphor*. Metaphor is the area of our interest and when quality and quantity are synonymous then math equations automatically transcend the normal duty of denotation and enter into the realms of connotation. This concept also bears some relationship to different concepts of infinity pioneered by the Russian-German Mathematician Georg Cantor, namely the infinities in gradation relative to the infinities in Counting.

Another tenet of verbogeometry is that it recognizes antonyms in only a few varieties. A simple antonym is a word whose antonym is a direct negation. (Example: just / unjust, probable / improbable or fertile / infertile etc.) A complex antonym is a word whose antonym is not a direct negation. (Example: just / unfair, probable / doubtful or fertile / barren etc.) There are also gradable (gradient) antonyms which are pairs that express relationships in a continuum, such as up and down. Complementary antonyms are pairs that express an either/or relationship, such as dead or alive. Verbogeometry uses all antonyms as if they were gradable. It is easy to find examples where poets use complementary antonyms as if they were gradable to create certain metaphors. Example: "Bob showed up half dead to work today."

Within the boundaries of verbogeometry it is important to understand that we view words as objects floating in space. When we focus on single words, with no context, they are alone inert relating to no other words. However, when we focus on words that have a synonymous partner we can easily imagine a line in space between the words. Probable and improbable are good examples of simple antonyms that we can view connected by a line. (Figure 1)

Life is full of dualities; it is hard to think about qualities without thinking about opposing ideas. We can view our 'probable / improbable' one-dimensional line as a number line but instead of values of numbers on the line, we think in terms about having different levels of meaning between the two words residing at each end of the line. Due to a number-line being a one dimensional axis it is easy to visualize a word-axis as an axis for a single spatial dimension. We call any pair of words connected by a line a word-axis. Two perpendicular number lines or word axes make a two-dimensional word-axis as well as defining a word-plane. We also have the ability to view the word-plane as an infinite number of coordinates delineated by the word-pairs much like the infinite number of coordinate pairs contained within a Cartesian coordinate system described in the realm of analytic geometry.

Figure 2 shows a visualization for the physics equation; distance = velocity multiplied by the time. Notice that the y-axis displays velocity and the x-axis displays time. When we multiply and blend the words in an infinitesimal weave, we arrive at the concept of distance in a tessellated product of the concepts of velocity and time. In another words by positioning the two axes perpendicular to each other, we view every value on one word-axis in relation to every value on the other word-axis. This method affords us a way to 'feel' the entire word plane or axis system with all its different augmented values and gradations. When we multiply two word-axes together we conceptually tessellate a two dimensional plane with different semantic values of the two words blended and augmented. If we were to take a normal Cartesian coordinate system and multiply the x positive integers (1 through 12) times the y positive integers (1 through 12) we get a tessellated plane as in Figure 3. (Figure 3) (Notice the intensity of blue relative to the value of the numbers).

To help us further visualize this concept let us create a word axis using the words red and green. In this instance, we are going to use red and green as nouns instead of adjectives. (We will use colors as adjectives later.) Let us multiply a red-green axis times another red-green axis and view it visually. (Figure 4) Multiplication of colors is similar to color addition except the disparate intensities of the colors are greater and follow a similar pattern shown in figure 3. The value of the 'numbers' is subjective and not as important as the relationship between the 'numbers'.

Figure 4 helps us to visualize different word meanings spread across a word plane. Let us create another example using two word-axes. However, let us use two different colored word axes instead of our previous example where both axes were the same colors. Following that, we will superimpose a set of different word-axes upon our color axes to compare how the system works.

To facilitate visualizing two different word axes lets look at the example with the word-axes red-green and blue-orange multiplied by each other and mapped on a Cartesian coordinate system. (Figure 5) (Note these diagrams are visual aids not scientific data.)

What is nice about using colors for our examples is that words used for colors function as both a noun and an adjective depending on our intent. When we map a word plane with word-axes that comprise colors and we use them as adjective synonyms, then this word-plane serves as a paradigm or a pedagogical tool serving as a general model for understanding all two axes synonym word-planes. Example: Let us create a word-plane using the two word-axes of noble/ignoble and just/unjust. (Figure 6)

The next step would be to superimpose the noble/ignoble; just/unjust word-plane onto our previous word-plane of blue/orange; red/green. In essence, we are pretending color blue to mean ignoble, orange to mean noble, red to mean just and green to mean unjust. Now we can see the meanings blend into each other in the different areas of our word-plane. (Figure 7)

We can see the color purple as blend of ignoble and just, red-orange as a blend of just and noble, yellow-green as a blend of noble and unjust and blue-green as a blend of ignoble and unjust. For the record, I certainly am not trying to say there is a relationship of ignobility and injustice with the color blue-green! This example is just a tool to help us with our own concept of visualizing a word-plane. However, we could create a different but, in my opinion, limited set of color metaphors for noble/ignoble and just/unjust. Or we could look at our color example as adjectives on their own merit. This method would automatically help us see them as metaphors. Example: She was red hot. He had a blue day. He was so green he did not know what was happening. Multiplying adjective word-axes together instantly create metaphors.

2. Word-coordinate Pairs: We have witnessed a word-axis with different values of an antonym pair along a particular axis 'x' or 'y' in one dimension. (Figure 1) We also have seen a word-plane with values of two antonym pairs along two axes 'x' and 'y' in two dimensions. (Figure 6) Furthermore, we can have word-cubes along the x, y, and z-axes in the third and word-hypercubes in the fourth dimension or we can have antonymic pairs in innumerable dimensions. There is no limit to the dimensional palette for our expressions. Each antonym word-pair adds a new spatial dimension to our expressive construction.

Let us talk about the spatial accuracy in defining the location of words in space. Once again, let us look at figure 6 and notice the antonym word pairs, just/unjust and noble/ignoble. However, let us focus our attention to the word-axis just/unjust. We know that we have defined a one-dimensional word-axis with different values of just and unjust but we do not know exactly where each of the words is located along the axis. We have no quantitative value for just or unjust. However, we do have a qualitative value and we know that the word exists somewhere on the axis. What is most important to us in verbogeometry is not the value as such, but the spatial relationship of the values to each other in space. Because the value or the meaning of a word is relative to the context in which it is used, each viewer individually creates his or her own context for meaning. Therefore, exact quantification of the word or its location in space is not possible. However, in some cases, it may be possible to restrict the context to a level where repeatable correlations exist, but those studies are more akin to denotation for the purpose of science. Scientific experimentation "proves" the equation to be mathematically correct and workable within a range of acceptability. In other words, experimental data defines viability of the relationships between the concepts in a scientific equation. On a side note: (When scientific equations are in the intuitive stages of development, there may be an argument to claim that they are in the realm of art, I personally might accept this view if it were not for the fact that their intention is not to make art.) In verbogeometry, we construct equations based on relationships between the qualities of our experiences to evoke meaningful aesthetic expressions of which most are connotative but some may be denotative.

Let us get back to the Cartesian coordinate system for a moment and reiterate the idea of coordinate pairs. A point on a two dimensional coordinate system would have values for x and y and would be expressed as such: (x,y) (Figure 1.) A point on a three-dimensional axis system would have values for x, y and z and would be expressed as (x,y,z). A four dimensional point would be expressed as (x,y,z,w) in the fifth dimension as (x,y,z,w,v) etc.

Before we get into multidimensional word-axes let just look at a simple two-dimensional word-plane with two word-axes. (Figure 8.)

The vertical axis is a synonym word-pair of praise and punishment and the horizontal axis is a synonym word-pair of love and hate. It is very important to realize that not only does the words love and hate define the identity of the horizontal or x-axis they also hold conceptual points in space along the axis and the same for praise and punishment with respect to the y-axis. The words which are conceptual points in space define a metaphoric value along its respective axis and can be notated as a coordinate pair similar to (x,y) So you may ask what would a coordinate word-pair look like? Let us look at the two points identified as point 1 or P1(love,praise) and point 2 P2(hate,punishment) (Figure 8.)

3. Midpoint Formula in Verbogeometry *Any analytic geometry equation can use coordinate word-pairs instead of numbers to express poetic forms*. Let us use the midpoint formula to express the exact point between the two points P1(praise,love) and P2(punishment,hate) from figure 8. Before we look at coordinate word-pairs let us refresh the use of the midpoint formula in analytic geometry. To find the midpoint between two points on a Cartesian coordinate system we add the x coordinates together and divide by 2 to find the x value for the midpoint and we also add the y coordinates together and divide by 2 to find the y value for the midpoint or
$(x1 + x2)/2 = x0$ and $(y1 + y2)/2 = y0$.

Let us take a different approach and replace the numeric variables in the midpoint equation with the words/concepts of love, hate, praise and punishment. We will use the form of coordinate word-pairs

P2(love, praise) and P1(hate, punishment). The midpoint formula now shows us that P0(x0, y0) will be formed by the substitution of (x1 + x2)/2 = x0 with (love + hate) = x0 and (y1 + y2)/2 = y0 with (hate + punishment) = y0. Now we have expressed the exact point between love, praise and hate, punishment. (Figure 9.)

4. Verbogeometry with Trigonometry One method in trigonometry to solve the angle theta (Figure 10) is to find the inverse tangent of y/x. Now let us look at a similar expression within verbogeometry and looking for the value of angle theta. This time we define the y distance as the difference between the concepts of barren and infertile (think number-line again) and let us define the x distance as the difference between the concepts of infertile and fertile. (Figure 10)

If we want to know the angle of theta we have to take the inverse tangent of y/x or the inverse tangent of (barren - infertile)/(fertile - infertile) (Figure 10)

Notice that 'barren and infertile' is a complex antonym and 'fertile and infertile' is a simple antonym as previously defined. Simple antonyms and synonyms can be seen existing in orthogonal spaces. *This is interesting because we can see that there exists in verbogeometry a geometric construction where a line expressed as a simple antonym is normal (90 degrees) to a plane containing all of the complex antonyms related to the line which is expressing the simple antonym.* To illustrate this idea lets look again at the relationship between the simple antonyms 'fertile' and 'infertile' and the synonyms 'barren', 'fruitless', 'unproductive', 'sterile', 'impotent' which reside on the plane that is normal (90 degrees) to the line created by the simple antonyms. Furthermore you can draw lines from all of the synonyms back to the complex antonym 'fertile'. (Figure 11)

This idea also lends itself to prismatic structures where we have a group of parallel simple antonyms whose endpoints construct polygonal faces on two parallel synonym-planes. (Figure 11) Example: Let us define one synonym plane containing the words 'pleased', 'content', 'affected', 'satisfied', 'enchanted' and 'sympathetic'. The other plane contains the following simple antonyms for the previous group of synonyms: 'displeased', 'discontent', 'disaffected', 'dissatisfied', 'disenchanted' and 'unsympathetic'. Due to the synonyms of one plane have corresponding simple antonyms which create lines 90 degrees from the synonym-plane then the simple antonyms are synonyms of each other and reside on their own individual synonym plane and because the lines are 90 degrees to each other the planes must be parallel. The former verbiage is a lot easier to understand visually (Figure 12)

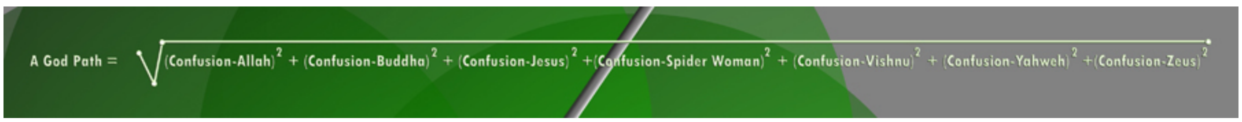
5. Distance Formula and Verbogeometry. As we have seen, to calculate the distance between two points, we need to describe our points by its coordinates using the nomenclature of the coordinate pair. Let me reiterate, describing a point in verbogeometry is no different from numerical coordinates except we use words. Lets look again at the example in figure 9 where we used the midpoint formula to find the exact point between the points: P1(love,praise) and P2(hate,punishment) but instead of putting them in the midpoint formula lets put them in the distance formula. (Figure 13)

Here we have an expression for the distance between the points P1(love,praise) and P2(hate,punishment) in two dimensions. But we can also use verbogeometry in any number of dimensions including hyper-dimensions. But before we look at hyper dimensional verbogeometry lets look at another example which we will express in the third dimension. The following example uses a three dimensional Cartesian coordinates system with 3 simple antonym word-axes. (Figure 15) The first axis is noble / ignoble the second axis is just / unjust and the third axis is loyal / disloyal.

Now lets look at the expression for the distance between the points P1(noble,just,loyal) and P2(ignoble,unjust,disloyal) (Figure 14)

Notice the green line in figure 15 is the visual representation for the mathematical expression above. However, it would be much easier to visualize if we were able to rotate the axis. Figure 15 is an isometric view, which I chose to use because it is best for viewing the axis but unfortunately at the expense of viewing the spatial orientation of the green line.

Now let us look at verbogeometry in a hyper-dimension. Let us look at the distance formula used in seven dimensions: Figure 16 shows the mathematical poem 1+1+1+1+1+1+1+1 =1 This is a metaphorical piece that creates a metaphoric path from the concept of confusion, to where seven deities meet. The piece uses the analytic geometry distance formula in a seven dimensional space where each dimension is a gradation from confusion to a point where a deity exists. Lets look at the coordinate pairs for these two points P1(confusion, confusion, confusion, confusion, confusion, confusion, confusion) and P2(Allah,Buddha,Jesus,Spider woman,Vishnu,Yahweh,Zeus) The detail of figure 16 looks like the following:



The latter expression can also be written as: A God Path = ((Confusion-Allah)^2 + (Confusion-Buddha)^2 +(Confusion-Jesus)^2 +(Confusion-Spider Woman)^2 +(Confusion-Vishnu)^2 +(Confusion-Yahweh)^2 +(Confusion-Zeus))^.5

In conclusion what I have shown is scratching the surface of the possibilities of verbogeometry. Verbogeometry can be taken in vast directions that I have not covered or will be able to cover. I hope, in the future, more people join in to explore the possibilities of verbogeometry.

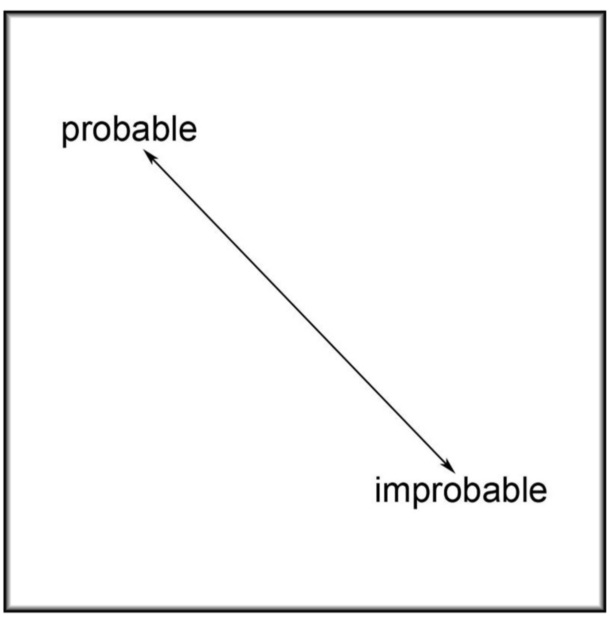


Figure 1. Word Axis

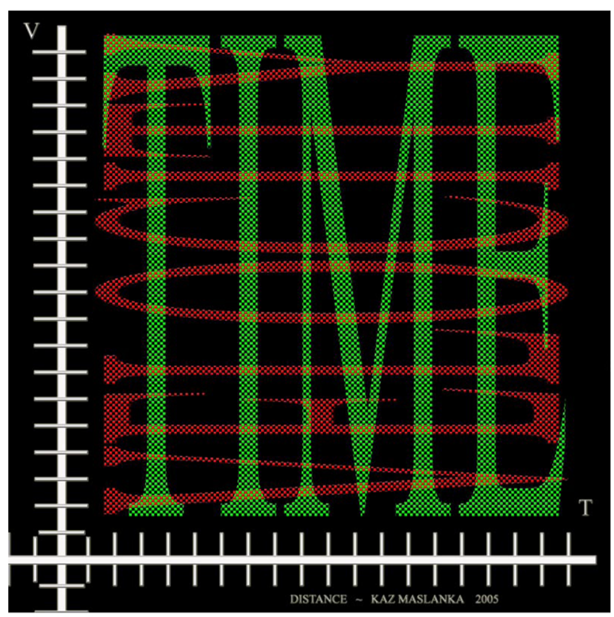


Figure 2. Distance = (velocity)(time)

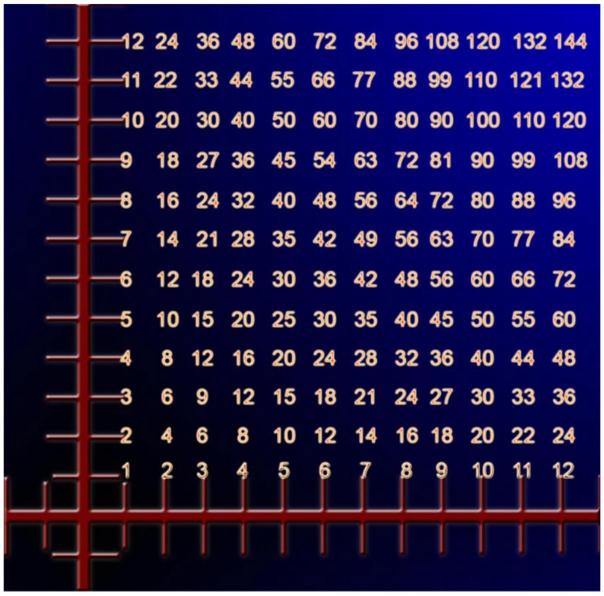


Figure 3. Multiplication table

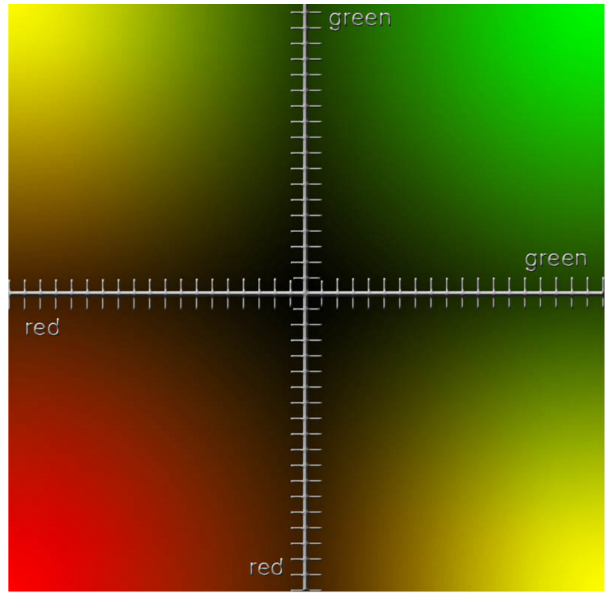


Figure 4. Two Red-Green Axes

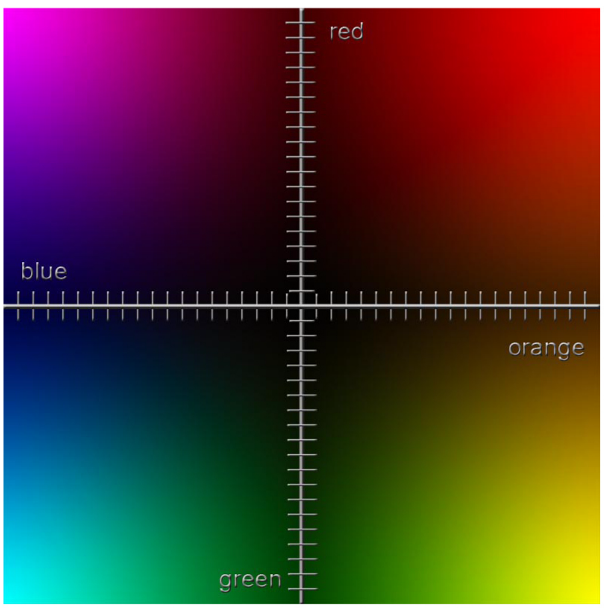


Figure 5. Red-Green Blue-Orange Axes

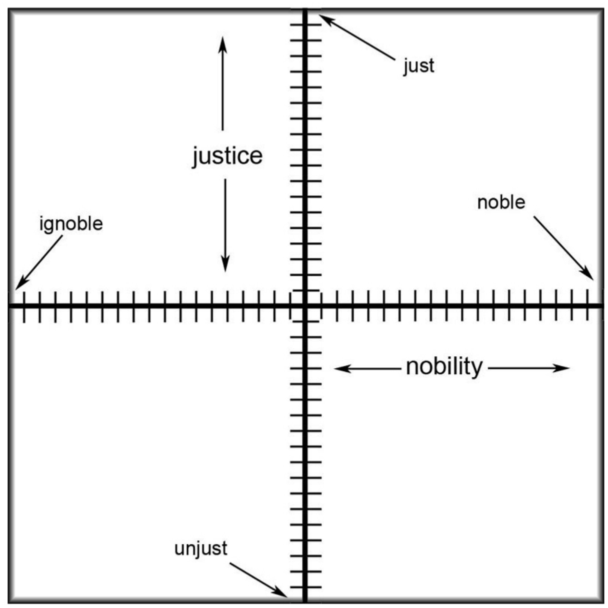


Figure 6 Just-Unjust Ignoble-Noble

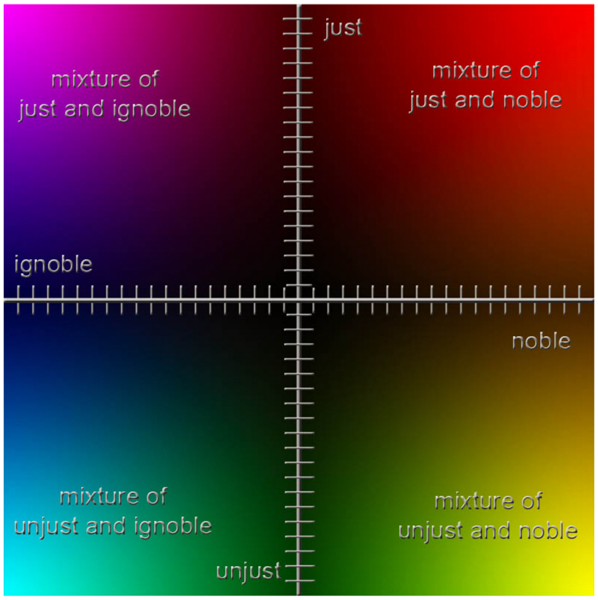


Figure 7. Two Axes Mixture

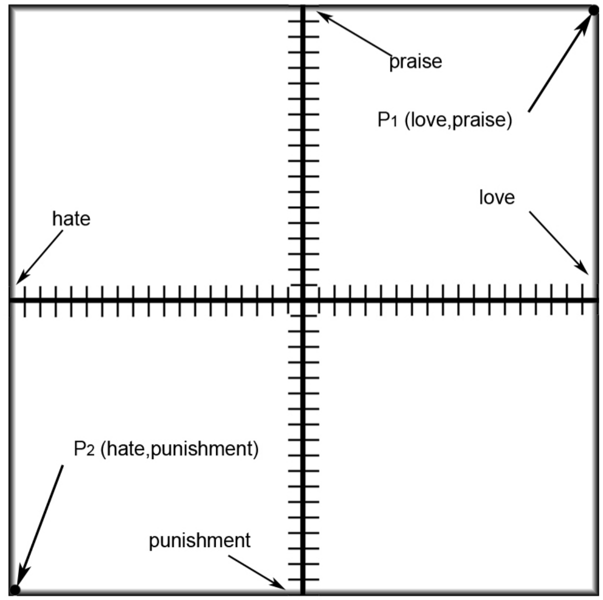


Figure 8. (love,praise hate,punishment)

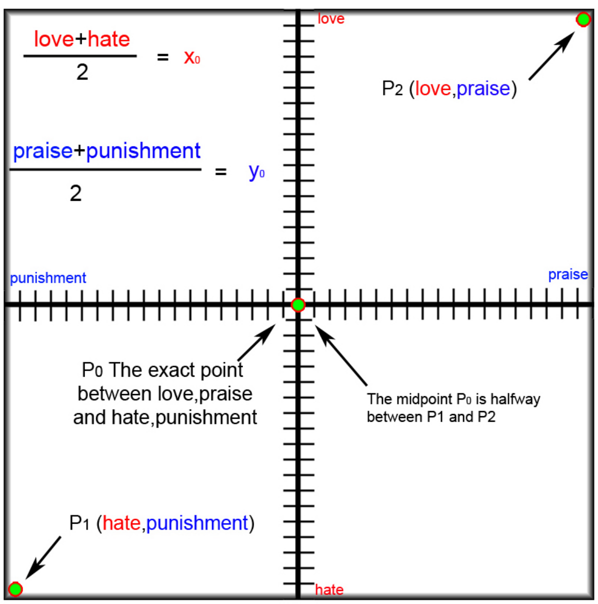


Figure 9. Exact point between (love,praise) and (hate,punishment)

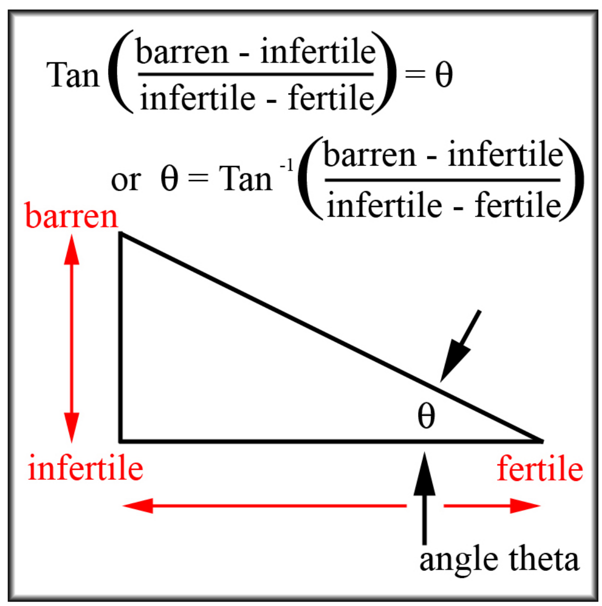


Figure 10. Verbogeometrical Trigonometry

distance between P1(love,praise) & P2(hate,punishment)

$$d = \sqrt{(\text{love} - \text{hate})^2 + (\text{praise} - \text{punishment})^2}$$

Figure 13 Distance between (Love,Praise) and (Hate,Punishment)

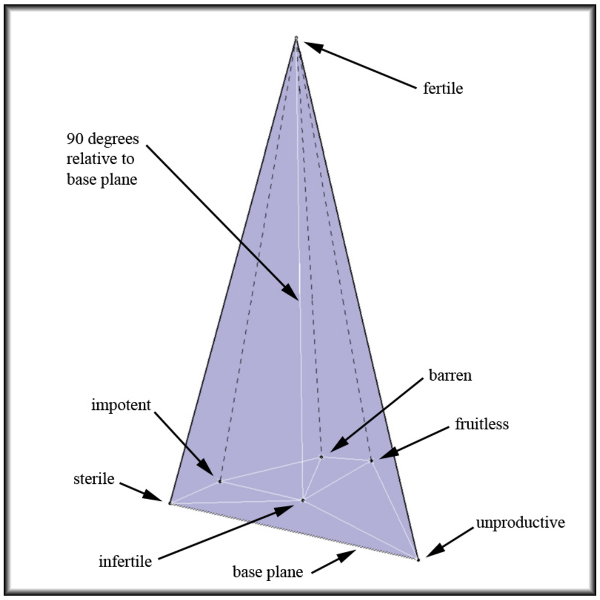


Figure 11. Prismatic Structures

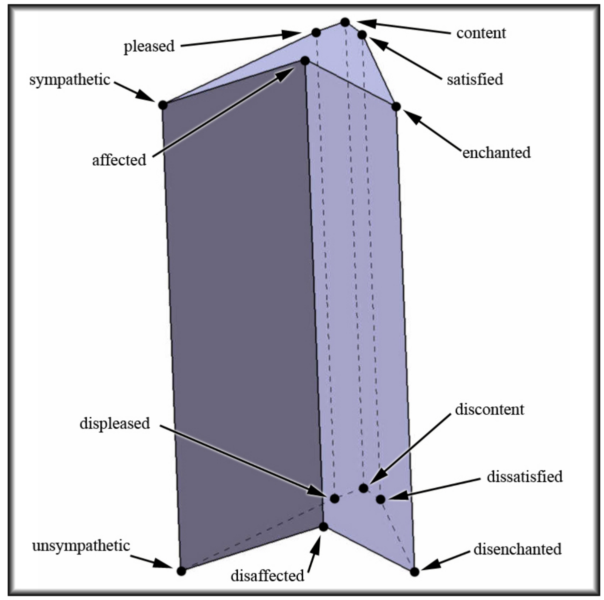


Figure 12 Prismatic Structures

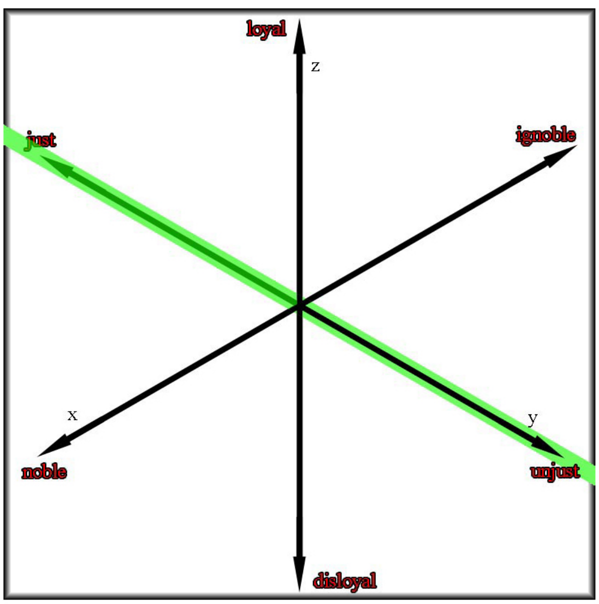


Figure 15. Three Dimensions

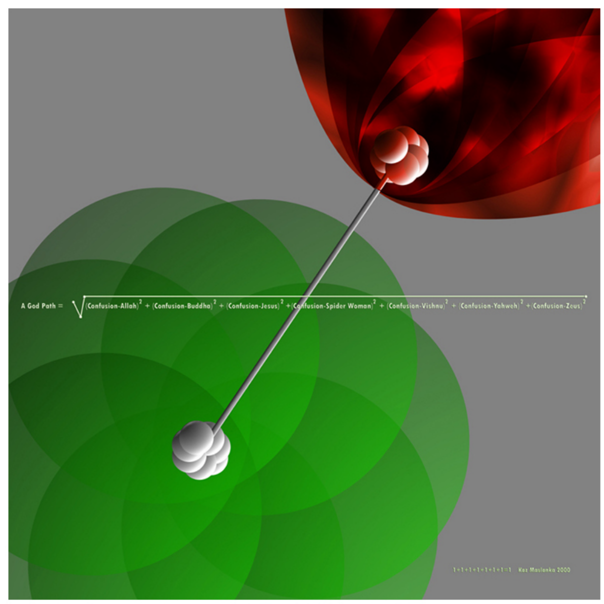


Figure 16. Seven Dimensions

distance between P1(noble,just,loyal) & P2(ignoble,unjust,disloyal)

$$d = \sqrt{(\text{noble} - \text{ignoble})^2 + (\text{just} - \text{unjust})^2 + (\text{loyal} - \text{disloyal})^2}$$

Figure 14. Distance between (noble,just,loyal) and (ignoble,unjust,disloyal)

This paper also at the following URL:
http://www.kazmaslanka.com/verbogeometry/verbogeometry.html