

Antimetabole and Image Schemata - ontological and vector space models

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AbstractIn this paper we describe the linguistic analysis of the rhetorical figure Antimetabole. We extend our analysis to cognitive processes, centering on Image Schemata as a structure of understanding. Representing elements in symmetry as force vectors we define a graphic representation that shows the balancing forces in multi-dimensions based on the Image Schema BALANCE. We also describe an ontology that models the form of the figure and further extends the description to force vectors in balance.

Keywords. image schema, rhetoric, antimetabole, balance

1. Introduction

In this paper we propose a novel analysis of rhetorical figures from the perspective of Image Schemata, specifically the schema of BALANCE.

The group of discernible patterns in natural language that have been termed as rhetorical figures for millennia shine out for their power to cajole and move. These patterns are all around us whether we notice them or not and, in fact, there is no such thing as “degree zero, purely literal language” [1]. This is well understood for some conceptual figures known as tropes—particularly metaphor, metonymy, and irony, which Cognitive Linguistics has revealed are ubiquitous in natural languages. But it is also true of formal figures, known as schemes, which rely not on conceptual relations but on features of the signal itself, such as repetition, sequential position, and symmetry. When we recognize the constituent elements of figures we see that they are frequently present too in visual, logical, mathematical and conceptual areas of our understanding of the world, e.g. in cinematic themes [2]. This leads us to value the importance of the element as well as the gestalt figures themselves. For instance, repetition may contribute to the signal salience of some element in an utterance, but may also contribute to a more general pattern realized by that utterance. The object of an account that recognizes both individual elements and gestalt structures is to achieve “the right degree of overlap between the organizing principles of cognition and the organizing principles of figuration (similarity, contrast, balance, repetition, and the like)” [1]. We believe that Image Schemata, which, to the best of our knowledge, have not been utilized in an account of rhetorical schemes, can help achieve the right degree of overlap, particularly on the cognitive side of the equation.

The rhetorical scheme of Antimetabole is an ancient one recognized in texts as early as the 6th Dynasty in ancient Egypt and remains ubiquitous in modern discourse, from

advertising jingles and tweets to proverbs and pop songs [3]. Though little noticed (not unlike many forms of metaphor), occasionally its use flares up enough for special attention, as it did in the 2012 US Federal Election [4]. It may be defined as the repetition of at least two words in reverse sequence. A well-known example from Dumas is “all for one and one for all”. Its importance as a device can be seen from the frequent and broad range of usage to which it is put and the examples in domains other than that of the written or spoken word. The general pattern to which the written device conforms also applies to fields such as mathematics and visual imagery.

Historically analysis of Antimetabole has mainly been within the Arts. Recent activity has centred on more detailed analytical approaches (e.g. [5] and [6]), but both understanding fully the power of this scheme and development of computational techniques to automatically analyse and discover it leave plenty of work ahead. The key problem is in elucidating a structured approach to understanding. Our investigations of Image Schemata intend to bring some cognitive structure to our analyses. This paper describes developments in a method of representing the balancing forces within an instance of Antimetabole and also a new ontological description that combines the formal elements of a figure with the Image Schema BALANCE.

2. Background

Image Schema is a phrase born from the Cognitive Linguistic movement of the latter part of the 20th century and specifically the work of George Lakoff and Mark Johnson in the 1980s. The word *schema* itself, however, from the Greek $\sigma\chi\eta\mu\alpha$, meaning “shape” or “form”, as used in the current context has a provenance more philosophical and psychological than linguistic — an influence on the choice of this particular word given that the works of Johnson and Lakoff lie in the fields of cognitive science and philosophy. It is this original meaning that gives rise to the systematic ambiguity we are attempting to navigate in this paper, between rhetorical scheme (a figure based on formal features of language) and image schema (a cognitive entity based on relations that are best realized in formal terms, such as containment and relative position). Immanuel Kant describes his *transcendental schema* as a “mediating representation” between “category” and “appearance” [7] implying a connective role between something innate and something perceived— in-between *a priori* and *a posteriori* knowledge. Piaget’s work on child psychology influenced a generation of thinkers and continued the idea of a schema as a constituent of the structural basis of cognition: “schemas are the knowledge structures that underlie all thinking” [8].

Rudolph Arnheim’s work in the 1970s on the psychology of balance including concepts of *force*, *weight* and *locus* influenced Mark Johnson and George Lakoff who took this analysis to a deeper level. The idea of a schema as a structural phenomenon continued, it being “a means of structuring particular experiences schematically, so as to give order and connectedness to our perceptions and conceptions.”[9]

There are many recognised Image Schemata, but one fundamental example is BALANCE. Johnson elucidates extensively on this structure and we discuss this further in subsequent sections: “balance metaphorically interpreted also holds together several aspects of our understanding of our world”[9].

Non-computational analyses of the BALANCE image schema are various and range from expositions of justice [10] to literary analysis [11].

Studies of complex patterns of natural language used to inform or cajole are as ancient as language itself. A rich history and associated record of rhetorical figures has descended down the ages so that we presently have a large core of recognised patterns. It is not a closed set, however, and more investigation into the less well explored languages and further research on the languages already well understood will surely reveal new and undiscovered features. In this light it is probable that an exhaustive list is not possible even in principle (see [6] for a taxonomy). We call the set of these various patterns *Rhetorical Figures* which includes very familiar structures such as metaphor (as tropes), but many more obscure examples from Accumulatio to Zeugma.

Antimetabole is a figure that is well recognized, but not necessarily by its name. As above, at least two words (or word groupings) repeat in reverse order, often around a central axis point. A few examples are given below which show particularly well the balanced formation of words:

If you fail to plan, you plan to fail. (1)

A place for everything and everything in its place. (2)

Fair is foul and foul is fair. (3)

These examples are relatively simple in their structure although there are certainly complex sets of connotations employed. Another famous example is President John F. Kennedy's inaugural address in 1961:

Ask not what your country can do for you - ask what you can do for your country
(Kennedy & Sorensen 1961) (4)

This passage not only reflects the balanced set of words and phrases, but also utilizes the figure of Antithesis. By adding a negation the balance is thrown out of whack, further adding to the weight of the intent and the rhetorical power of the passage by nature of a contrast feature. Mitrovic et al describe Antimetabole in some detail and a number of ontological approaches to rhetorical scheme modeling [12].

Studies of the cognitive basis for rhetorical figures are not extensive. Gibbs [13] discusses the understanding of BALANCE and Harris et al [1] propose an ontological analysis involving descriptions of the form/figure pairings which is a ubiquitous, or even a necessary, structure of natural language.

2.1. Balance Image Schema

We take Johnson's work on the BALANCE Image Schema as a basis for our analysis. For Johnson, the idea of balance is predicated on the basis that cognition is essentially physical and relates strongly to existing in the world -

“We almost never reflect on the nature and meaning of balance, and yet without it our physical reality would be utterly chaotic”[9]

As an essential cognitive structure, Johnson describes a prototypical BALANCE schema in terms of force vectors where forces are relative weights directed around a point of axis: “Balance involves a symmetrical (or proportional) arrangement of forces around a point or axis”[9].

Subdivisions of the BALANCE schema given by Johnson are shown in Figure 1

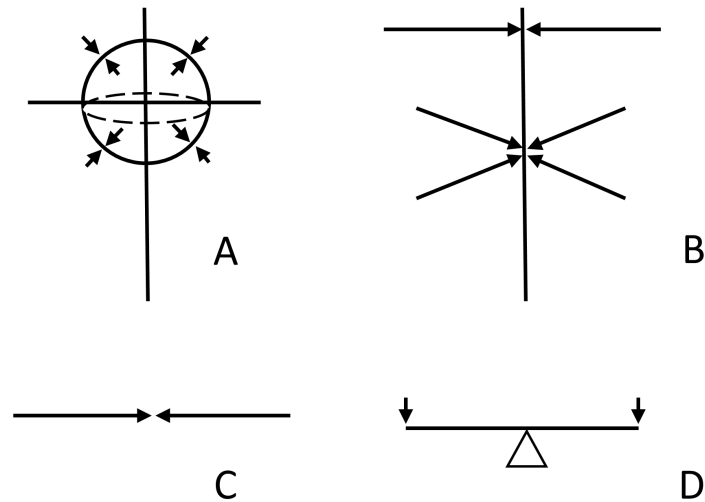


Figure 1. Axis Balance [9]

In Figure 1 plate B shows the prototypical set of vectors centering on a one-dimensional axis representation. Plates A, C and D in the same figure show Johnson's divisions of the prototype in terms of axis variability and the resulting conceptual loci diversity which is a result of the nature of the elements in balance. Plate A represents EQUILIBRIUM, plate C is POINT BALANCE and plate D is TWIN-PAN BALANCE. Some concepts lend themselves to a specific sub-division because the concept itself seems to fit around the physical constraints of dimensional vectorisation. For example if we consider the balance of *justice* we might conceptualize this as a binary division of truth/falsehood and the corollary guilty/innocent. This binary contrast suits the TWIN-PAN BALANCE because these concepts, like the physical movements of a weighing scales, vary in weight in two possible directions (up or down) and with two possible subjects being compared.

Johnson further analyses the BALANCE schema away from the vector model and creates a set of types:

1. Systemic Balance – the perceived proper balance of forces implied by a functional unity, e.g. a system such as weather which we might perceive as balanced by rainfall and sunshine
2. Psychological Balance – the structure of our experience concerning the “balance of intellectual, physical, social, religious and model activity”
3. Balance of Rational Argument – comparing opposing sides of an argument as balance by virtue of the *weight* of evidence
4. Legal/Moral Balance – a concept of a natural order being upset and imbalanced is re-weighed and put back into proper balance according to *argument, force* and *weight*
5. Mathematical Equality – a mapping from the physical into the abstract mathematical so that equations exist and can be balanced in terms of abstract concepts (numbers, algebraic terms etc)

These types define conceptual dimensions within which things in the world are able to be balanced as perceived by observers. Each one relates to a set of concepts and associated meanings in common usage. Roughly, we can refer to these notions as noetic balance. These are higher order conceptual arrangements that reflect states of knowledge (an argument may be balanced or unbalanced, a climate and an ecology may be in balance or out of balance, and so on). While these types of balance are often expressed through linguistic patterns, as we will see for some of them, they are not our direct concern. It is the formal linguistic patterns themselves that matter for an account of rhetorical schemes.

Ultimately what is described as in-balance encompasses elements inferred and abstracted by the perceiver. From metaphorical projections we can say that related ideas such as “psychological states, arguments, moral rights and mathematical operations” are in balance as much as the orthographic words on the page that invoke them.

2.2. *Antimetabole*

One for all and all for one
— Dumas, *The Three Musketeers* (5)

For y am sorwe, and sorwe ys y
— Chaucer, *The Book of the Duchess* (6)

This “poorly researched and largely unknown but remarkably widespread rhetorical device” [1] is characterised by a repetition of elements around a central axis, but with a reversal of the positions of the elements which gives rise to a symmetry. Often symbolised as ABBA (A and B referring to elements in the text - usually words or word groupings). There are many examples of this pattern in natural language, but the form also pervades in mathematics, logic and visual phenomena. A symmetry of multiple parts is not uncommon in any aspect of life, however Antimetabole is different in the sense that it is linguistic and therefore encourages semantic and pragmatic responses that create a gestalt structure which is both memorable (for its repetition) and powerful (for its constructive inference). Antimetabole belongs to the super-set of figures called *chiasmus* (from the Greek letter *chi* (χ) for the literal criss-cross nature of the character’s form) which includes any figure that has a reverse repetition structure.

A key method for analysing the meanings of natural language and especially useful in understanding rhetorical forms is to look for form/function pairs. Decoupling the way a word or phrase appears (form) from the way it evokes meaning (function) allows us to focus separately on these items and remove any confusion in a perceived overlap. For example, we might say that the form of the word “all” from Dumas’ example above is a noun representation with two occurrences varying between object and subject grammatical roles, while “one” a noun representation with two occurrences varying between subject and object grammatical roles, and that their positions relative to each other (as well as their respective grammatical roles), pivot on a single axis word (“for”); meanwhile the two proximal phrases (“one for all,” “all for one”) pivot on another single axis word (“and”). The function of the “all” could include the ideas of collaboration and support from an individual’s contribution to the group effort and also from the group’s support of individuals.

Antimetabole always features balance. The repetition of elements around an axis always gives two or more features that act in symmetry somehow. Antimetabole is complex, however, and the elements in balance can range from simple words to more complex

concepts. We describe these different levels of balancing elements in terms of Johnson's division into types as described in the previous section.

Ruan et al [3] describe the cognitive affinities evoked by this pattern as OPPOSITION, REPETITION and SYMMETRY. Further detailed analysis shows the underlying structure as containing these essential functions:

1. QUANTITY: the number of repeating elements
2. SEQUENCE: an ordering of repeating elements is essential
 - (a) The ORDER of the sequence gives rise to semantic functions of IRRELEVANCE OF PRIORITY and COMPLETENESS
 - (b) The DIRECTIONALITY of the sequence gives rise to RECIPROCALITY and OPPOSITION
3. PROXIMITY: elements must be proximal which gives rise to a "joint conceptual force"

Harris further argues that a more thorough investigation of rhetorical forms such as Antimetabole is a continuation of the "renewed interest in tropes, such as metaphor" which, famously, located a rich seam of understanding through the field of Cognitive Linguistics. We believe that the melding of rhetorical analyses with established theories in Cognitive Science (i.e. Image Schemata) is of potentially fruitful benefit to the development in our understanding of animal cognition. The process of viewing that which is ubiquitous, but not well understood through a lens of cognitive analysis has worked well in the past (e.g. metaphor) and we have no reason to think it would not continue to bring benefits with the combination of other rhetorical schemes and image schemata.

3. Methods

Our research focuses on the multi-dimensional balances brought about conceptually by the figure of Antimetabole. We take inspiration from the Image Schema theory and segment the linguistic information – semantic and pragmatic – gleaned from a particular form and put these into a multi-dimensional model. We devise a graphing output that highlights the balances involved in a figure and also propose a numerical vector-based model for future work.

Using the same premise of multi-dimensional balances, we devise an ontological approach that specifies the elements in a computationally-accessible format via the Ontology Web Language (OWL).

3.1. Analysis

Our intention is to analyse various texts for inherent elements in balance according to the types (or as we define them, dimensions) from Johnson, as described above. We proceed by example in the analysis of two figures — from Dumas and Kennedy. Dumas' famous saying "all for one and one for all" obviously contains a surface repetition of two words - "all" and "one". It also has a pivot point between the first "one" and second "one". The balance evident between the written words we consider as a Systemic Balance — when we see words that are the same we notice the similarity and perceive a force relationship

between each word and the axis. There are multiple levels of balancing forces in play. An individual word may be considered balanced with another, but also there is a balance of word groupings, i.e. not only do the two instances of “all” balance, but the phrases “all for one” and “one for all” can be said to pivot around the central word of “and”. We know too that the meaning of the words in this saying is related to duty and responsibility — if we know the context of the story from which it is taken. As we bring into focus the further interpretations of the words — concepts of support and contribution — we move from a Systemic Balance to a Psychological Balance. Finally we might see that there is a larger interpretation of the duty to one’s companions and a responsibility to one’s cause. This is the Moral/Legal Balance as an extension to the Systemic and Psychological.

Looking at Kennedy’s famous quote from his 1961 address: “Ask not what your country can do for you - ask what you can do for your country” we see, on the surface, orthographic words that repeat – “your country”, “can do for”, “you”. We see similar structures as in the Dumas example and, again, the repetition leads us to pinpoint a central axis about which the repetition occurs. This isn’t always a precise operation, but in this example we take the division between words 9 and 10 (“you” and “ask”) as the axis. We take the orthographic repetition to be a Systemic Balance.

When we delve deeper into the figure we can see the underlying meaning of the passage (some of which is sketched out by a number of political commentaries e.g. [14]). The writer’s intention is not simply a repetition of words for effect, but a contrasting and balancing set of forces that result in concepts such as *duty*, *Government*, *rights* etc.

We infer from the phrases “your country” and “you” a metaphoric transfer to concepts of *Government* and *Individual* respectively. We understand the context of Kennedy’s address and the Systemic Balance inherent in concepts such as country, leadership and individual etc. We show this as an imbalance in favour of Government — from a simplistic assessment of the physical and metaphorical extent of the two.

We consider further the implications of the passage. In effect the idea of the individual taking from the state (emphasised by the negation in the first phrase) is contrasted with the idea of the individual giving to the state. We add “taking from” and “giving to” as balanced concepts. We move away from a Systemic Balance and into Psychological Balance at this level.

Finally we extrapolate to the concepts of “rights” and “responsibilities”. These are elements in balance around the Legal/Moral Balance type.

Our interpretation and mapping to schema type is not a definitive assessment - many other interpretations are possible.

We show in Figure 2 a graph of some of the concepts and forces evoked in this second rhetorical figure. Directed lines are vectors with length representative of the relative weight of concept. In this format we can see the balances and imbalances resultant from the analysis. We also show relationships between elements as dotted lines. These don’t play a direct role in the relatively simple balance relationships we document, but are important for the conceptual analysis. A quantity value must be assigned to the vectors in order to use them mathematically. The nature of calculations that would provide these numbers is beyond the scope of this paper, but within the scope of future work. The elements in balance and the calculations that derive vectors from them are open to interpretation and very much subjective, however we believe that consensus can be gained on many areas and, where this is not possible, a publishing system that allows the

co-existence of different perspectives would be sensible – this is, after all, how humans often see the same thing.

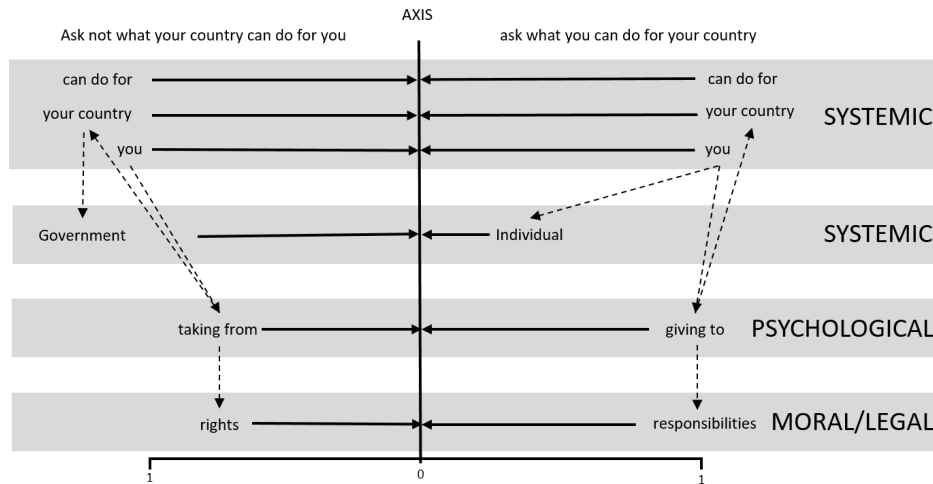


Figure 2. Kennedy's Antimetabole - BALANCE interpretation graph

Further utilising Johnson's description of factors – implied by an Image Schematic analysis as vectors – we describe a multi-dimensional vector space as a way to imagine and calculate a particular Antimetabole figure. Our inspiration is Johnson's analysis and our motivation is the potential for intuitive visualisation and the power of mathematical analysis. We use a simple Euclidean Vector with magnitude and direction to indicate the position and weight of the term relative to our point of axis. Our dimensions relate to the types described above, but are certainly not limited to these. The output so far is restricted by practicality: our imagination and the ability to represent greater than 3 dimensions in a diagram. Figure 3 shows two graphs that represent a hypothetical analysis of balanced elements from Kennedy's speech. Each vector is directed at the axis (0,0 in the graph), but has differing direction depending on the dimensional weights associated to the particular element that asserts the vector. The vectors that arise from a figure would be combined into a multi-dimensional vector space.

We don't necessarily include mathematical or logical assumptions of vector space analysis in our model, but these could be avenues for inclusion in the future in order to take advantage of useful techniques such as Vector Algebra or Support Vector Machines. Mathmetising a collection of vectors that represent the various elements within a passage of natural language is not new, but to do so with in the cognitive framework of Image Schema theory would be worth investigating. The benefits of vector analytics to language analysis is significant ([15] [16] [17]) and one potential research goal would be in rhetorical scheme categorisation. The maths is relatively straightforward, but the determination of the content of vectors is as complex as computational rhetoric can be and we leave that to future research.

Our focus in this paper is Antimetabole and BALANCE, however we foresee other figures being profitably viewed through the perspective of BALANCE and other schemata. Figures such as *Anadiplosis*, *Paralellism* and *Epanalepsis* exhibit elements

of balance, and other schemata such as SOURCE-PATH-GOAL can relate to *Climax* or *Amplification*, while *Digressio* has elements related to DIVERSION.

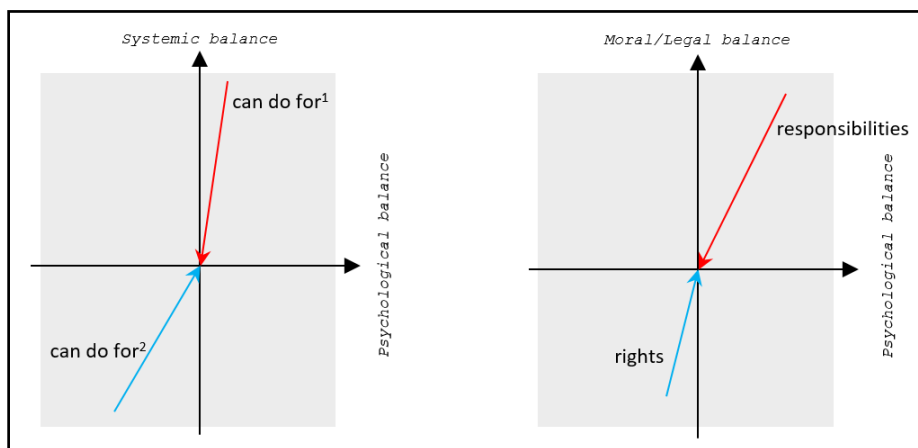


Figure 3. 2-dimensional vector space representations of balance forces

3.2. Ontology

We describe a novel ontology of the balance components of the rhetorical figure Antimetabole with reference to the form and function of constituent elements and also containing a model of the cognitive affinities involved and their relation to the Image Schema of BALANCE¹. The purpose of developing this ontology is manifold:

- to provide a structural reference for future analyses including computational approaches
- to generate greater understanding of the figure by the process of ontological analysis
- to gain insights into the cognitive processes underpinning the conceptualisation of this figure

Harris et al 2017 [1] describe the Rhetfig project that has analysed this particular figure for the composition of an OWL ontology. The authors describe the various approaches to modelling a complex linguistic structure such as Antimetabole. Their analysis calls the conceptual elements involved in rhetorical figures Cognitive Affinities such as CONTRAST, SIMILARITY, SEQUENCE, REPETITION and POSITION. Antimetabole, by their analysis, can utilize the affinities of REPETITION, SEQUENCE and CONTRAST. In order to describe these affinities, our ontology must contain classes for the basic elements that are repeated, in sequence and that contrast each other.

As stated previously, when we define the concept of balance as a repetition around a point then we can see that balance is a feature of the Antimetabole figure. Especially relevant is the SEQUENCE affinity which describes the ordering of the elements in the figure and therefore the location of the focal point of the balance structure. In the symbolic

¹ Available at <http://repositori.com/sw/onto/antimetabolebalance.owl>

representation A-B-B-A, the axis must exist in-between the B symbols for the symmetry to work and the distances from the axis of each element are comparable and equal — the As are equidistant (and so are the Bs) from the perceived axis.

Figure 4 shows a graph of the ontology for the rhetorical figure of Antimetabole and the BALANCE Image Schema. Various classes are present that describe the figural form, e.g. Word and Similarity. The *Word* class is central to the ontology and *affects* the concept of a *Force Vector* which in turn *evokes* the *Balance* class. The key concepts we attempt to specify are *Axis*, *Vector* and *Word*: these three concepts form the centre of a structure that exemplifies the things that are in balance and about which they are in harmony and/or tension. Further, it conceptualises a sense of a directed force which evokes the vector model and also relates to Johnson’s foundational work. Our graph is underspecified at present and we may attempt to define the details further if required by the models that take it as a basis for analysis.

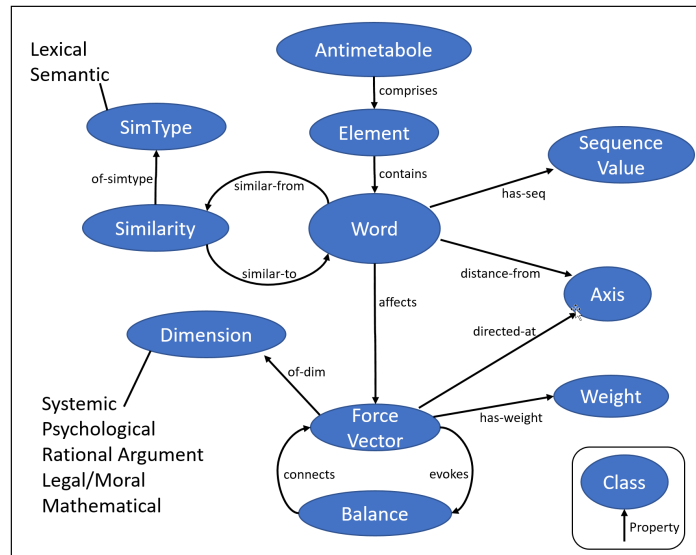


Figure 4. Ontology graph - combining Rhetorical Figures with Image Schema

We add logic rules around this ontology in order to define knowledge of a particular instance of Antimetabole and its sub-structure. For example, the SWRL² rule below (7) produces the instance of *Balance* between two *Words* when they evoke *Force Vectors* of the same *Dimension* and directed at the same *Axis*.

$$\begin{aligned}
 & Axis(?a1) \wedge Word(?w1) \wedge ForceVector(?fv1) \wedge evokes(?w1, ?fv1) \\
 & \wedge Word(?w2) \wedge ForceVector(?fv2) \wedge evokes(?w2, ?fv2) \\
 & \wedge directed-at(?fv1, ?a1) \wedge directed-at(?fv2, ?a1) \\
 & \wedge Dimension(?d1) \wedge of(?fv1, ?d1) \wedge of(?fv2, ?d1) \\
 & \rightarrow Balance(?b1) \wedge evokes(?fv1, ?b1) \wedge connects(?b1, ?fv2)
 \end{aligned} \tag{7}$$

²<https://www.w3.org/Submission/SWRL/>

An important goal with ontology engineering in the domain of language analysis is to be able to share and re-use the work of others. By publishing ontologies and knowledge bases to the internet we hope to encourage others both inside and outside of academia to benefit from agreed definitions for shared concepts. This ontology is represented in OWL (Ontology Web Language) and therefore useful for integration into the Semantic Web or other computational applications that can utilise XML representations.

Evaluating our approach takes a number of forms; we consider both the output and the process. The process of analysis has brought new understanding and shone a light on new pathways of discovery yet to be followed. The ontology as an output is not yet evaluated, but future work will include using the OWL descriptions in action for computational processing.

4. Discussion

Our goal is to elucidate structure to the understanding of Antimetabole. We attempt this through a novel method for analysing rhetorical figures, a new graphical representation, a route to future mathematisation, and an ontological framework that is computationally tractable and re-usable. The core of our analyses is the principle that things in the world are readily balanced and that human sensibilities (as Image Schemata) are fundamental to cognitive processes and can be modelled into complex patterns of natural language (rhetorical figures).

We have attempted to sketch the possibility of a strong connection between Image Schemata and Rhetorical figures. There is rich pickings in these areas and we scope some future directions for research, below.

Aside from analyses of metaphor in relation to Image Schemata, we believe this research is novel in its elucidation of rhetorical figures from the perspective of Image Schema theory. Others have investigated cognitive processes in poetry and allegory, for example (e.g. [11][18]) and many others the computational and cognitive dimensions of rhetoric (e.g. [5][1]), but we have pushed this general theme into a new direction. We recognise that the picture we paint is limited to one particular figure and one particular schema, but we expect that there are many more areas to be investigated, as described briefly above, that will include the diverse and extensive range of rhetorical figures and include more schemata beyond that of BALANCE.

We hold to the idea that ontology engineering often brings benefits both in terms of the eventual output (e.g. as an XML representation to be shared and utilised), but also for the process itself of analysing a particular domain. This has been a theme of the work in analysing rhetorical schemes where significant insights have arisen from ontological activities. This is not the only goal, however, and we aspire to take all ontologies forward into computer models that do a number of different tasks from describing, quantifying, discovering and elucidating on what is a fascinating and important domain of artificial intelligence research.

5. Future Work

We hope that a number of areas for further investigation are evident after the work described in this paper. Arguably the ultimate goal of a cognitive analysis of language is to

better understand its workings and to shine a light on a further, deeper understanding and perhaps even automation through Artificial Intelligence; we are still a significant distance from being able to fully comprehend what creatures are doing with their brains when they communicate. A perhaps unforeseen outcome of deep investigations of language is the difficulty in agreeing on what things mean. There are multitudinous interpretations of any span of text (which is to be expected and encouraged), but singular semantics can be valuable and through consensus between humans in concert with computer models we can hope to add important knowledge to shared resources.

We highlight some areas we believe would be fruitful for further analysis, below:

1. In the work described in this paper we focus wholly on the figure of Antimetabole. There are many others that rely on the concept of balance and we would like to continue this analysis to figures such as Anadiplosis (“The mountains look on Marathon And Marathon looks on the sea” [Byron] or Antithesis (“That’s one small step for man, one giant leap for mankind. [Neil Armstrong]”)
2. We have also focussed solely on the Image Schema of BALANCE. There are a host of important schemata that we would very much like to investigate from Containment to Source-Path-Goal etc. We believe that much more interesting and useful understanding will be gathered by looking in more detail across the range of conceptual functions
3. We only barely touch on the power of the metaphorical transfer to Force Vectors and mathematising the concept space of a rhetorical figure. Vector mathematics is a mature set of structures for representing abstract and concrete entities and we expect that future work in this direction would be extremely interesting. One interesting avenue we would like to see is a mathematical comparison of figures in vector terms. We appreciate that the formation of the precise vectors within a specific figure is open to interpretation, but given the right framework we imagine it would be possible and very useful to compare individual examples of figures in quantitative terms.
4. When we described the example from Kennedy we modelled the relationships between elements simply as dotted lines. We didn’t take them as part of the balancing structure. This was a necessary move for clarity, but we believe that these relationships are important and it is likely that by analysing them we will be able to extend the ontology and vector models accordingly.
5. We have talked about the benefits of the ontological approach and the understanding that comes from simply thinking hard about how certain kinds of language (and cognition) work. We value these benefits, but also realise that evaluation is important. A next step must be to structure the over-arching goals of Computational Rhetoric so that a consistent and measurable framework can be drawn-up from which even greater advances can be created.

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