The Integrals of the Functions in Aristotelian Ethics

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ABSTRACT. In this short paper it is aimed to show that the concept of the "function"(the ergon) is such a concept that beyond its use in everyday language as a process or functioning, it can be considered as a mathematical function, and rather than modeling the phenomenon that is thought (by Aristotle)to correspond to reality, it models the derivative of this phenomenon, therefore it can be likened to a derivative function and the function obtained through its integration would better explain the actual phenomenon, and interestingly, existentialists, who often reject the function argument, approach this more closely.

1. Introduction

What does "function" mean to Aristotle? In The Nicomachean Ethics [NE], after introducing the concept of "human good" and determining this kind of highest good, which is end of the things we do, which we desire for its own sake (everything else being desired for the sake of this)(NE 1. 2, 1094a19-20), as happiness ("eudaimonia") by stating that most people agree on this but cannot determine what exactly it is (1. 4, 1095a17-22); he introduces his concept of the function("ergon"). Between the lines 1097b22-34 and 1098a1-8 Aristotle gives us ,in his words, "a clearer account of what [function] is" (NE 1.7, 1097b23). Briefly, it can be defined as "an active life of the element that has reason"(NE 1.7, 1097b23). Also he adds: "function of man is an activity of soul which follows or implies reason"(NE 1.7, 1098a7-8). By having such a strong tool he attains the ability to assign new and more tangible meanings to the abstract notions of "good" and "bad". He explains this with an example:

> "(…)eminence in respect of goodness being added to the name of the function (for the function of a lyre-player is to play the lyre, and that of a good lyre-player is to do so well): if this is the case [and we state the function of man to be a certain kind of life, and this to be an activity or actions of the soul implying a rational principle, and the function of a good man to be the good and noble performance of these, and if any action is well performed when it is performed in accordance with the appropriate virtue: if this is the case], human good turns out to be activity of soul exhibiting virtue, and if there are more than one virtue, in accordance with the best and most complete."
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> (NE 1.7, 1098a10-18)

Thus it can be said that Aristotle's function (ergon) has a central importance for his ethics. He sets the measures for the "good" and "bad" according to it.

> "The ergon of a thing, in general, is what it does that makes it what it is. Not everything has an ergon, for there are things to be which is not to do anything. But when something has an ergon, that thing's good is specified by it. The proper ergon of man, by which human exellence is measured, is that which makes him a man rather than anything else"
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> (Nagel, 1972, p. 253)

On the other hand, despite all Aristotle's efforts for describing the human animal by its rationality alone in book X, in a reductionist manner, there are very few counterarguments opposing this attempt at oversimplification. One of them belongs to Juliette Christie. She argues that " if this is the case, human eudaimonia cannot be what Aristotle takes nine books of the Nicomachean Ethics to describe."(Christie, 1996, p. 78). However, even she cannot deny the explainig power of the argument. Especially, I find the figure drawn by Roy C. Lee in his paper which is named 'The Function Argument in the Eudemian Ethics' particularly useful for better understanding the connection between virtue (the good) and functions in Aristotelian ethics.

Figure 1: Divisions of the Function Argument in "The Function Argument in the Eudemian Ethics"
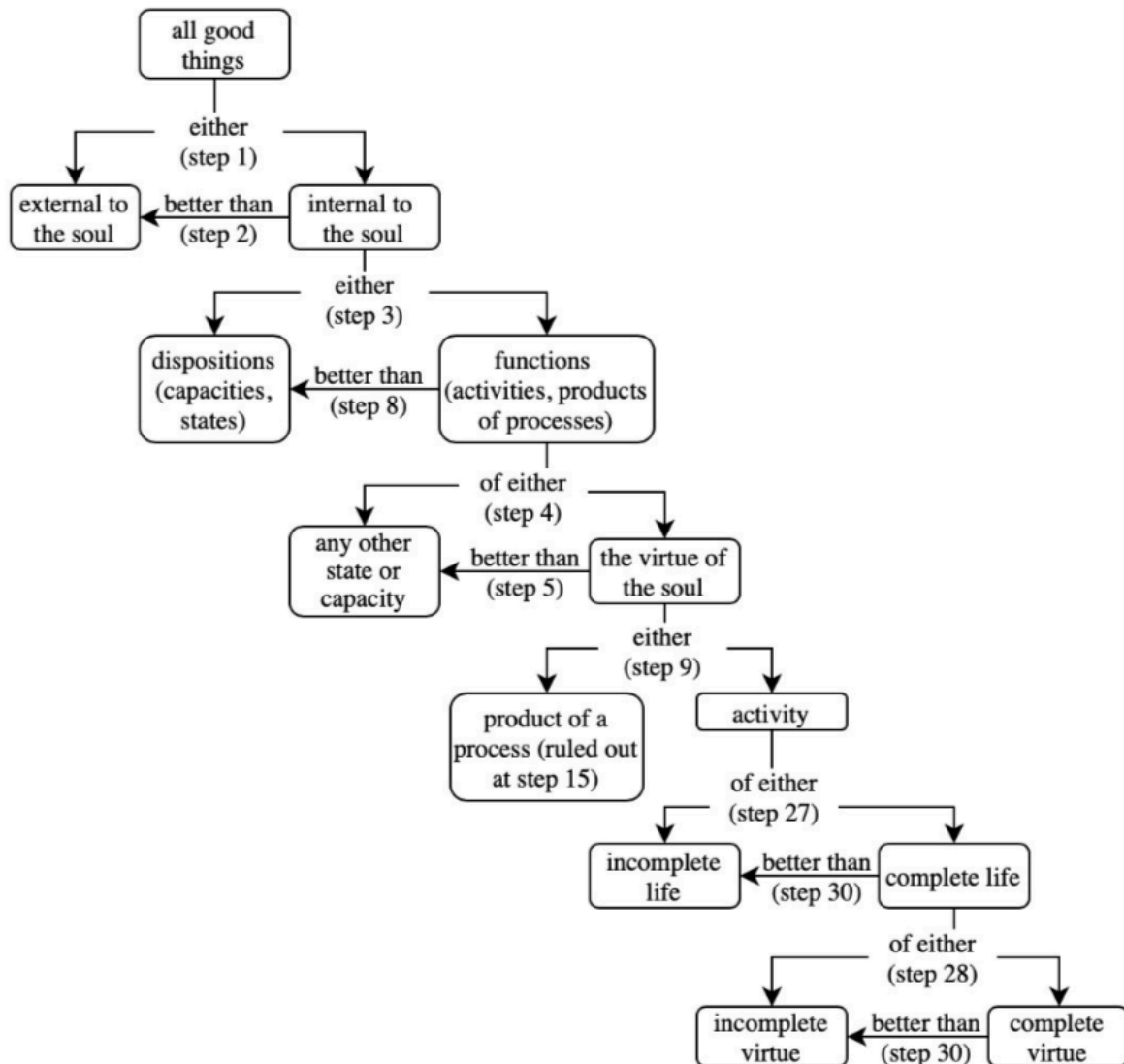
Despite the fact that the function argument is highly connected with Aristotle's understanding of virtue or the purpose of life; since our main argument is not directly related to these discussions which could fill books, we will merely concentrate on the "ergon" itself. First of all why should it be translated as "function"?

The word "ergon" could be translated in many ways, but the word "function" seems to be the best translation for several reasons:

1. The word "Ergon" expresses the main purpose or "function" of an entity.
2. This concept gives us a simple model to understand relatively complex "objects".
3. It enables us to examine the dependency relations between these simplified ethical objects.
4. To Aristotle, each entity has an identifyingly peculiar,"unique" ergon.

For these very reasons, which make the word function the most suitable translation for ergon, Aristotle's concept of ergon is highly similar to the mathematical functions. Before explaining the similarities between them, it should be explained what a mathematical function is. "A function f is like a machine that produces an output value $f(x)$ in its range whenever we feed it an input value x from its domain"(Thomas, 2014, p. 2) (Figure 2).

Figure 2: A diagram showing a function as a kind of machine.

"Functions are a tool for describing the real world(…)A function can be represented by an equation, a graph, a numerical table, or a verbal description(Thomas, 2014, p. 1) Therefore, the similarities between (in an Aristotelian sense) ethical functions and mathematical functions can be written in a consecutive order:

1. A function has a purpose or "function" of taking an input value to an output.
2. A function gives us some simple models to understand certain complex mathematical objects modeling real objects' behaviours.
3. Functions provide simplified models that enable us to understand complex dependency relations between certain variables.
4. A function can be said to have an identity, since it has a certain behaviour of assigning values.

Consequently, both concepts, namely the ergon and the mathematical functions, can be used to understand the fundamental properties of an object or being and how these properties function. Therefore, in many respects, they should be considered to be having more than simple metaphorical similarities.

2. Why Are They Derivatives

To be able to clarify the main point of the article it could be better to go over the Aristotle's "function argument". It can be summerized mainly as the claims that (i)a human life is good to the extent that it performs its function well(like an eye's function of seeing), (ii)a thing's function is peculiar or unique to the kind, (iii)human rational capacity is what is peculiar to human life, (iv)the function of human being is to reason, (v)a human life is good to the extent that it performs its rational capacities well[that is, to the extent that it lives a life of virtuous activity(both an exercise of the intellectual and character virtues)].

Correspondingly, when analyzed it can be seen that Aristotole's functions behave as if their objects were infinite and ideal objects. Given the vast time scale of the universe, instantaneous time (which we experience) is being extended to the infinity by ignoring time periods that might be infinitesimal relative to it. Thus rather than identifying the actual shape of the curve (speaking geometrically), it (an Aristotelian function) identifies an infinitesimal piece of the real curve. This means that if it (the real shape) is curved, Aristotelian function can give us only the linear representation of it; that is, merely the slope of that point (instant). It should be understood the notion of derivative to detect the similarity. "derivative gives the function's instantaneous rate of change with respect to x"(Thomas, 2014, p. 107) where x is an input variable. These abstract arguments can be seen and understood more clearly from the ugly figure below.(Figure 3)(It is ugly because it is drawn by me. The aim is to show how linear it appears when zoomed in)

Figure 3: The Graph of a Derivative or a Slope at a Point
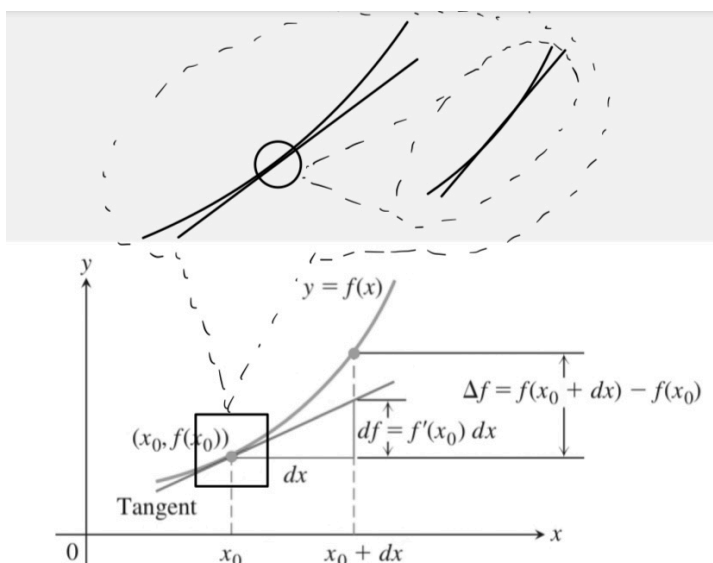
Aristotle argues that each entity reaches its best potential when it fulfills its function. And this argument supports our claim further. "One of the most important applications of the derivative is its use as a tool for finding the optimal (best) solutions to problems."(Thomas, 2014, p. 185). When a function reaches its maximum or minimum values, curve starts to move in the opposite direction. The ergon concept of the Aristotle can be said to be concerning optimal functions or real potentials of the beings. Similarly, derivatives of the functions represent instantaneous changes, "meanings" or "directions" of those functions.

Derivative functions' features also resembles those of Aristotelian functions in another aspect. They have the same claim to be universally valid. One is ethical or ontological, the other is mathematical. ("Mean Value Theorem" could also constitute a significant similarity to the Aristotle's "mean between extremes" argument but it will not be discussed here.)

3. How to Anti-differentiate Them

Anti-differentiation is a process that can be thought as the inversing process of the differentiation (which was the process of obtaining the derivative). It is not a complicated process for there is certain algorithms to do it in a simple way. With the help of integration of the infinitesimal pieces, which were previously divided infinitesimally, the needed function can be obtained from its derivative. It should not be understood in some Hegelian sense. We sum up these infinitely small partitions in the real meaning of the word. For example, if we anti-differentiate the function $f(x)=x^2$ we will get the function $F(x)=x^3(1/3)+C$, where C is some arbitrary constant; which means there are infinetely many possible F functions. After this point, it cannot be easily identified where the function starts or where it ends, which implies deep connotations.

4. The Existentialist Integrals

As we have seen so far, since it is not possible to know the constant values (Cs) resulting from the anti-differentiation, some initial value problems arise. This problem forms the gist of the debate between the supporters of Aristotelian theories and the existentialists. Despite the fact that the existentialists did not accept the Aristotle's function argument -because of their belief that humans cannot have a predetermined purpose, some kind of essence or ultimate end- it can be said that they possess a kind of function concept. However, their concept of function is not predetermined or cannot be easily explained. Well known existentialist philosophers like Jean-Paul Sartre argued against the Aristotelian notion of a predetermined function (ergon) or purpose. Sartre, for instance, stated that "existence precedes essence," which implies that human beings first exist and then with their free wills they determine their own functions or essences through their deeds and choices, in contradiction to Aristotle's view that does not have the constant value C in his "equation". This existentialist stance posits that humans are not designed for any particular purpose and are free to choose how they will live, which is a significant departure from the Aristotelian notion of a predetermined human good or function. Though existentialists mostly concentrated on the human freedom, their counterarguments can be generalized for human beings are not the only entities that are in a state of change in the universe.

5. Conclusion

In "The Nicomachean Ethics" book 1, Aristotle ,by discussing the "highest good" for humans, constructs his ethical theory. He determines the highest good for humans as "happiness" (eudaimonia). This is not a bodily happiness or a mere pleasure, it is more like a mental peace resulting from living a virtuous life, characterized by rationality and the exercise of the soul's virtues.

In book 2, it is discussed the topic of what moral virtue is. According to Aristotle it should be a result of habit, not teaching or an inherent ability. Virtue is the mean between extremes. It can be gained through practice. Practical wisdom is the thing that can be needed for this purpose, to choose the right action at least.

In book 10 he focuses on contemplative life, pleasure, happiness and rejects the arguments that the pleasure is inherently bad or it is the greatest good. Rather, he claims that pleasure is a vital part of a contented life when combined virtues. These can be considered as a brief summary of Aristotelian ethics. As it has been shown so far, Aristotle's "function (ergon) argument" is extremely important in providing criteria for good and evil to his ethical system.

But, however powerful tools the function argument may have provided, when human or any other living (or non-living) thing is examined apart from evlutionary context, since there exists a constant or a non-constant change, this examination is condemned to be -at most- a mere derivative of the function which explains the real phenomenon. In science, simple explanations can be extremely precious but for the most cases (especially for the complex systems) they are less likely to be true.

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