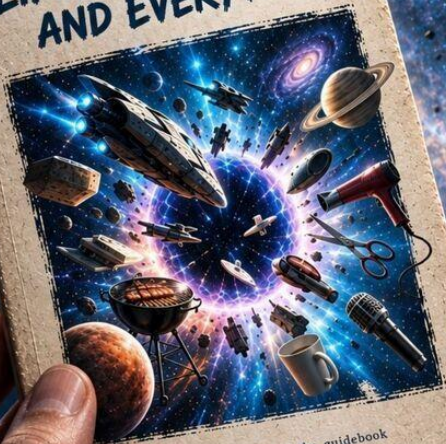


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Vladimir Sayapin

TSFK: LIFE, THE UNIVERSE, AND EVERYTHING



*The only version of the guidebook
approved by the Galactic Federation.

Vladimir Sayapin TSFK: Life, the Universe, and Everything

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Аннотация

Life, the Universe and Everything are indirectly connected to this book. Everything is here. Solving moral dilemmas — by mathematical calculation. The search for meaning. The value of life. Strong AI and the destruction of humanity. And much more that you never even thought to ask about. The book does not claim to be humanity's greatest work. It simply explains the path of a developing intelligence in the universe. And, while it's at it, everything else.

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Introduction

Human beings make decisions under incomplete knowledge. No choice exists independently of some representation of the situation, its causes, and its possible consequences. The fewer known relationships there are between phenomena, the more assumptions a decision contains, and the higher the probability of error.

This problem is not eliminated by accumulating individual facts. Even a substantial amount of knowledge does not mean knowing all the relevant relationships between known and unknown phenomena. Therefore, until finite knowledge is reached, every decision remains a decision made under conditions of uncertainty.

This gives rise to a fundamental question: **how should an intelligence act if it is forced to make decisions without possessing complete knowledge of their consequences?**

The Theory of the Search for Finite Knowledge proceeds from the premise that the ultimate task of cognition is to reach a state in which the unknown no longer limits the ability to draw justified conclusions about reality. In a finite system, this may mean exhaustive knowledge. In an infinite system, finite knowledge may be represented by a finite set of principles that makes it possible to determine its structure at any level.

Until this state is reached, intelligence has no basis for

absolute certainty. Therefore, it must act while simultaneously preserving the possibility of correcting its own errors. From this follows the principle of reversibility of consequences: under insufficient knowledge, decisions that minimize irreversible harm and preserve future possibilities for changing the decision should be preferred.

However, reversibility alone is insufficient for comparing incompatible actions. For this, it is necessary to take into account the probabilistic structure of the future: possible events, their probabilities, potential consequences, the cost of error, the stability of the result, and the possibility of further accumulation of effects. This gives rise to the problem of rationally comparing future states under incomplete knowledge.

This work examines, in sequence, the limits of knowledge, the necessity of acting before it is reached, the principle of reversibility of consequences, the concept of potential, and the mechanism of rational choice. It then derives the search for finite knowledge as a systemic goal from these propositions and examines the implications of the theory for autonomous strong artificial intelligence.

The main task of this work is not to describe desirable behavior, but to derive it from the limitations of knowledge.

Part I. The Limits of Knowledge

Chapter 1. Decision and Knowledge

Any decision constitutes a choice between possible actions. A choice is determined by a representation of the current state of a system and of the consequences of the available actions. Therefore, a decision depends on knowledge of the situation itself and of its relationships with other phenomena.

If all relevant relationships between an action and its consequences are known, the choice may be justified. If some of these relationships are unknown, the consequences have to be assumed. The greater the number of relevant unknowns, the greater the uncertainty of the result.

This can be represented as follows: an action (A) has a set of possible consequences ($C_1, C_2, \dots, C_n$). With complete knowledge of the system of relationships between (A) and (C_i), the choice is determined by the known consequences. With incomplete knowledge, part of the set of consequences or the relationships to them is unknown, and therefore the decision contains an element of assumption.

Consequently, the degree to which a decision is justified is limited by the degree of knowledge on which it is based. It is impossible to obtain a reliable conclusion about the unknown

solely from the known if the necessary relationship between them has not been established.

This does not mean that incomplete knowledge makes a decision impossible. It means that every decision made before the relevant uncertainty has been eliminated contains a probability of error.

The following question arises: is there a limit beyond which uncertainty can in principle be eliminated?

Chapter 2. Finiteness and Infinity of Knowledge

The amount of possible knowledge is determined by the structure of the reality that must be known. If the totality of what exists has a finite structure and a finite number of fundamentally distinguishable states, then an exhaustive description of this totality can, in principle, also be finite.

If reality is infinite, however, this does not imply the impossibility of finite knowledge. An infinite object can be specified by a finite principle that determines its structure at any scale. In such a case, describing the object does not require enumerating an infinite number of states.

Therefore, it is necessary to distinguish between **the amount of what is being described** and **the amount of the principle sufficient to describe it**. The infinity of the former does not imply the infinity of the latter.

Thus, there are two fundamental cases.

In the first case, finite knowledge may constitute exhaustive knowledge of a finite reality.

In the second case, finite knowledge may constitute a finite system of principles from which the properties of an infinite reality follow.

Consequently, the question of the finiteness of knowledge cannot be reduced to the question of whether the Universe is

finite. In both cases, a state is logically possible in which the unknown ceases to be a fundamental obstacle to inference.

This state will henceforth be called **finite knowledge**.

Chapter 3. Finite Knowledge

Finite knowledge is a state of knowledge in which there are no fundamentally unknown relationships necessary for obtaining justified conclusions about the reality under consideration.

Finite knowledge does not have to contain a description of every possible event as a separate fact. If all events are determined by a finite system of established principles, knowledge of these principles is sufficient to determine an infinite set of their manifestations.

The meaning of finite knowledge therefore lies not in the maximum quantity of accumulated information, but in the elimination of fundamental uncertainty. As long as there is an unknown relationship capable of changing a conclusion concerning the question under consideration, knowledge cannot be regarded as finite in the relevant sense.

The attainment of finite knowledge means a transition from the necessity of making assumptions to the possibility of deriving conclusions. If all necessary foundations and relationships are known, the unknown ceases to be an independent source of uncertainty.

However, humanity is not in a state of finite knowledge. Therefore, the limit described above has not only theoretical but also practical significance.

Before it is reached, decisions must be made under incomplete

knowledge. Therefore, the next task of the theory is to determine a principle of behavior under conditions in which final certainty has not yet been attained.

Part II. Humanity Before Finite Knowledge

Chapter 4. The Inevitability of Uncertainty

Finite knowledge has not been reached. Therefore, humanity does not possess sufficient knowledge to draw final conclusions about all relevant relationships within reality.

At the same time, the absence of finite knowledge does not eliminate the necessity of acting. Without action, the existence of the decision-making system itself would be impossible: maintaining a state is also the result of a choice and has consequences.

Thus, before finite knowledge is reached, human behavior has two inevitable features: the necessity of making decisions and the impossibility of determining all their consequences in advance.

Therefore, uncertainty is not a temporary error of an individual decision. Before finite knowledge is reached, it is a fundamental condition of decision-making.

It follows that a rational system must take into account not only the presumed correctness of an action, but also the probability of error. If unknown relationships are capable of changing the

outcome, an action should preserve the possibility of correcting the resulting error.

This raises the following question: what property of a decision makes it possible to correct an error after it has been detected?

Chapter 5. The Principle of Reversibility of Consequences

The consequences of actions may be reversible or irreversible.

A reversible consequence permits restoration of the original state or transition to another state without the final loss of the original possibility. An irreversible consequence eliminates such a possibility.

Under incomplete knowledge, it is impossible to guarantee the absence of error. Therefore, the choice of an action must take into account not only the presumed result, but also the consequences of a possible error.

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