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Тема выпуска *"Как учат машины, способные учиться"*

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Research article

Ramon Llull's Thinking Machine: Between Uselessness and Poetry

Ekaterina Samorodova (✉)
Moscow State Institute of International Relations, 76 Vernadsky Ave., 119454, Moscow, Russia
samorodova.ekaterina.78@mail.ru

Abstract

In 1937, Jorge Luis Borges wrote a characteristically engimatic historical note and literary reflection on „Ramon Llull' s Thinking Machine." It was a time in history when the idea of thinking machines to support human learning became ever more prominent. The latest generation of these machines was conceived in laboratories all over the world, their development still continuing today. At that time, Borges is looking back some 650 years at Ramon Llull's great arts which include an *ars inveniendi* and inspired rational speculation ever since. This is one of five essays that looks through the lens of Borges at contemporary learning machines. It focuses on Llull's idea of mechanical combinatorics as an instrument of cognition, and Borges's paradoxical conclusion that an unsound method turns out to be a productive tool for creativity and especially a tool for forging poetic metaphors. The essay considers parallels to modern technologies of artificial intelligence, neural networks, and generative creativity, and also reflects on the role of humans and machines in the process of thinking and the nature of meaning. In the gap between design and realization and from technical failure Borges shows that creativity cannot arise out of emptiness; it is not creation *ex nihilo*, it is choice from a multitude of possibilities.

Keywords: Ramon Llull; Jorge Luis Borges; Thinking machine; Combinatorics; Artificial intelligence; Formalization of thinking; Poetry; Randomness; Creativity

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Научная статья

Мыслительная машина Раймунда Луллия: Между бесполезностью и поэзией

Екатерина Самородова (✉)
Московский государственный институт международных отношений (МГИМО), пр-т Вернадского, д. 76, 119454, Москва, Россия
samorodova.ekaterina.78@mail.ru

Аннотация
В 1937 году Хорхе Луис Борхес написал характерную для него загадочную историческую заметку и литературное размышление под названием “Мыслящая машина Раймунда Луллия”. Это произошло в тот самый год, когда концепция “мыслящих машин” получила мощный импульс благодаря разработке Говардом Эйкеном механического компьютера Mark I, который впоследствии эволюционировал в электронный Mark IV. За 85 лет до появления ChatGPT (выпущенного в 2022 году) Борхес обращается к событиям 650-летней давности, анализируя великое искусство Раймунда Луллия, включающее в себя ars inveniendi (искусство изобретения) и ставшее с тех пор источником вдохновения для рационалистических спекуляций. Это одно из пяти эссе, которые рассматривают современные обучающиеся машины через призму Борхеса. Оно сосредоточено на идее Льюля о механической комбинаторике как инструменте познания, а также на парадоксальном выводе Борхеса о том, что несостоятельный метод оказывается продуктивным инструментом для творчества и особенно инструментом для создания поэтических метафор. В эссе рассматриваются параллели с современными технологиями искусственного интеллекта, нейронных сетей и генеративного творчества, а также размышления о роли человека и машины в процессе мышления и природе смысла. В разрыве между замыслом и реализацией, а также исходя из технической неудачи, Борхес показывает, что творчество не может возникнуть из пустоты; это не creatio ex nihilo (творение из ничего), а выбор из множества возможностей.

Ключевые слова: Раймунд Луллий; Хорхе Луис Борхес; Мыслительная машина; Комбинаторика; Искусственный интеллект; Формализация мышления; Поэзия; Случайность; Творчество

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INTRODUCTION

At the outset of his short text, Borges states a significant fact: "Toward the end of the thirteenth century, Ramón Llull (Raimundo Lulio or Raymond Lully) invented the thinking machine." Later, Athanasius Kircher, an inspired reader and commentator of Llull, gave the world the "magic lantern." The first invention was described in Llull's *Ars magna generalis*; the second was the subject of the manuscript *Ars magna lucis et umbrae.* Borges (1999) notes that both titles, along with the inventions they describe sound tempting and promising. Nevertheless, in objective reality the magic lantern is not at all magical, and the machine that Llull invented is not capable of producing "a single thought."

The statement of the existence of this machine is the key for understanding the meaning of Borges's article. The author immediately sets a certain direction for his readers: to understand why, despite all its advantages and positive forecasts, this ideal machine does not work, and how it can nevertheless help us understand even better and more deeply the nature of human thinking and creativity. Borges compares this machine to perpetual motion machines and mechanisms depicted on the pages of old encyclopedias, to various theories about what the world is and who people are. These theories unambiguously motivate our interest in the search for truth and deeper meaning. The main interest lies precisely in this discrepancy between design and result. According to Borges, it is here that something important and instructive is hidden (Borges,1999).

Borges formulates an important methodological principle when speaking about result and design, which consists in the equal importance of failed experiments for history as well as successes.

Llull's thinking machine is considered as an attempt to solve a fundamental problem, namely to organize knowledge in such a way that it would be exhaustive, free of sharp contradictions, and accessible to mechanical reproduction.

THE STRUCTURE OF THE THINKING MACHINE: A DIAGRAM OF DIVINE ATTRIBUTES

The structure of the machine itself is of particular interest. Borges openly admits that no one knows how exactly this machine came about. Nevertheless, one of the engravings in the famous Mainz edition (1721–1742) gives us the opportunity to guess the approximate time of its appearance. Borges undoubtedly prefers to see in this image a modest predecessor of more complex versions.

As for the machine itself, we see an intricate scheme or, as the author himself says, diagrams of God (fig. 1). At the very center is the letter A as a designation of God; along the circumference are the letters B, C, D, E, F, G, H, I, K, denoting respectively: goodness (bonitas), greatness (magnitudo), eternity (aeternitas), power (potestas), wisdom (sapientia), will (voluntas), virtue (virtus), truth (veritas), and glory (gloria). All the letters are connected to each other and all are equally close to the center itself (Borges,1999).

Borges explains in simple terms the meaning of this scheme. First is the arrangement of each letter in relation to the center – these are attributes that are in equal measure inherent in God. Secondly, there are the interconnections between attributes,

which form infinite phrases of truth – such as power is true, glorious, good, great, eternal, wise; or wisdom is strong and great; or virtue is true, majestic, and so on to infinity. And in this infinity lies the main message of this invention: “This immobile diagram with nine capital letters distributed among nine compartments and connected by a star and polygons is already a thinking machine.” There is no need to focus on the meaning of the expressions that result from such combinations. According to Borges, this is of secondary importance. This diagram could be filled with other words that correspond to another era, words such as “Entropy,” “Time,” “Electrons,” “Potential Energy,” “The Fourth Dimension,” “Relativity,” “Protons,” “Einstein.” Or “Surplus Value,” “Proletariat,” “Capitalism,” “Class Struggle,” “Dialectical Materialism,” “Engels” (Borges,1999).

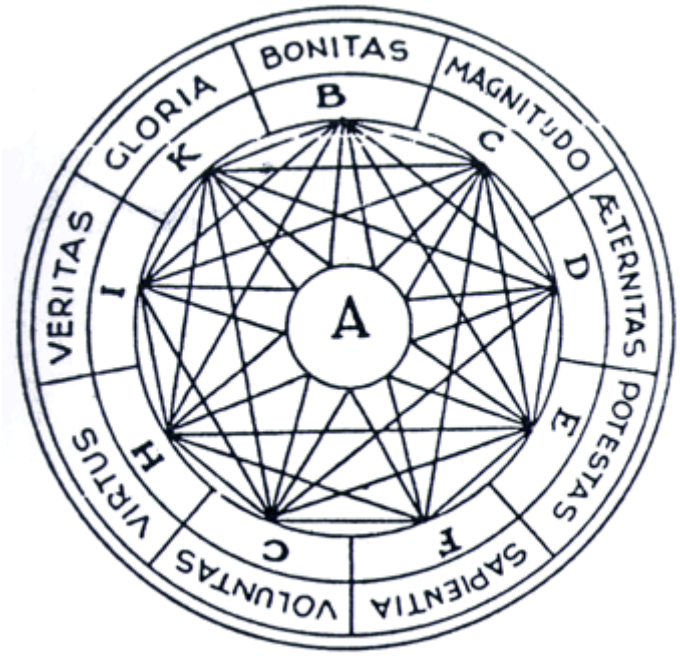

Figure 1. Diagram of divine attributes (Borges,1999, p. 156).

Borges mentions this to ironically emphasize the idea that nothing can give birth to absolute knowledge. Why? Because each era absolutizes its own concepts. For Llull, who created the machine, divine attributes were the final building blocks of reality. For the Marxist these are class struggle and the mode of production. For modern physics these would be elementary particles and the laws of physics. For the data specialist they are neural networks and large language models. For contemporary youth, the picture of the world includes yet again completely different key concepts. But all these sets of concepts are historically conditioned. They cannot give birth to final knowledge, just like the combinations of Llull's divine attributes. In Borges's words one hears a certain ironic criticism of Llull, but a thought arises: Will not current rhetoric also prove unconvincing to subsequent generations?

Moreover, one can say that the very idea of filling this “thinking machine” with modern concepts presupposes the possibility of decomposing the existing world into a set of elements that, combining with each other (as in the case of divine attributes – virtuous truth, and true virtue), give us a complete description of reality. Such an assumption concerns not only Llull's machine, but also modern projects – from the logical atomism of Russell and Wittgenstein to ontologies in computer science and vector representations of words in natural language processing. But the conclusion remains the same: various combinations cannot generate meaning automatically, since meaning requires interpretation, a special understanding of context.

At the very beginning of the article, Borges asserted that Llull's thinking machine does not work. But then, after analyzing examples of the diversity of “the colors of the tiger,” he shows that the problem is not that the machine does not work. The problem is that it works too well – it produces an infinite multitude of combinations but does not give a criterion for choosing between them. It does not allow distinguishing between true and false, meaningful and meaningless, etc.

This is exactly the problem faced by modern artificial intelligence systems. Modern language models, such as GPT or DeepSeek, generate text by combining probabilistic patterns. They can generate an enormous amount of text, but they cannot say how correctly they did it – they do not possess a criterion of truth. They will never answer the question of what the true color of a tiger is, but they will give variants of answers. Why? Because they do not have such a criterion in their training data.

In Borges's time there were no neural networks, and he himself could not have foreseen their appearance. But by analyzing the principles of Llull's machine, he accurately describes the fundamental limitation of combinatorial systems: a system cannot produce meaning out of emptiness, since meaning comes from outside – from interpretation, context, analysis, experience, etc. Llull's machine can combine but cannot understand what it combines.

And yet – what is the true color of a tiger? It can be orange with black stripes and a white belly; it can be dirty with dust; black in the darkness; white in the snow; or white because it is an albino. Color is not a true or permanent property of an object. It arises at the moment of interaction with reality. And reality is not fixed, unlike the meanings fixed by Llull's machine.

In his critique, Borges reminds the reader of Jonathan Swift’s celebrated satire of the combinatorial method in the third part of *Gulliver's Travels*. Swift describes a massive mechanical engine deployed at the Academy of Lagado, designed to generate texts with minimal human cognitive expenditure. As Captain Gulliver imperturbably observes, the device consists of a large wooden frame holding hundreds of wooden cubes:

> These bits of wood were covered, on every square with paper pasted on them, and on these papers were written all the words of their language, in their several moods, tenses, and declensions, but without any manner of order. The professor then desired me “to observe; for he was going to set his engine at work.” The pupils at his command took each of them hold of an iron handle, whereof there were forty fixed round the edges of the frame; and giving them a sudden turn, the

> whole disposition of the words was entirely changed. (Swift, 1726/2008, p. 170; Part III, Ch. 5)

We can feel here that Swift is ironizing the idea of the mechanical generation of knowledge. He finds unacceptable the thought that knowledge can be obtained mechanically through incomprehensible combinations and without the participation of reason.

One can compare this machine to a text generator that combines words in a text without analysis, but meaning arises only through human interpretation.

And thus we have come to the most important and fundamental question, both for Llull's era and for us contemporaries: Where does the machine end and the human being begin?

In Llull's machine, humans turn the disks, create connections, and interpret the result. In Swift's machine, someone turns the handles and copies down the found sentences. And assembles them into texts. In modern artificial intelligence systems, humans set the prompts and then interpret the answer. In all the examples given, the main source of meaning is human, and the machine is an intermediary, expanding human possibilities but not replacing them.

THE LAST DEFENSE: THE MACHINE AS A POETIC INSTRUMENT

The final turn of Borges's article comes very unexpected. Despite the fact that, as a source of philosophical knowledge, the thinking machine is absurd, it would not be absurd as a literary and poetic device. Let us highlight how Borges refers to Fritz Mauthner (1910-1911) who perceptively notes that a rhyming dictionary is a kind of thinking machine. A poet who needs an adjective for “tiger” acts exactly like such a machine. He sorts through variants until he finds one sufficiently unexpected. “Black tiger” may be a tiger in the night, and the “red tiger” is all tigers, because of the connotation of blood (Weiler, 1958; Borges, 1999, p. 159).

This greatly changes the attitude toward the entire work. Borges changes the role of the thinking machine: It is no longer an instrument of cognition but becomes a tool of creativity. And instead of knowledge it gives birth to metaphor. It does not give true concepts but creates an image! And therefore the “tiger” can be of different colors.

Borges contrasts science and creativity. Poetry and creativity, unlike science, do not need truth. They simply exist. And they do not need verification, just like the combinations of Llull's machine. In science, randomness is a problem, an obstacle, a direction that must be eliminated. In art, randomness is a source of the unexpected, of novelty, of creativity. For example, the Surrealists used automatic writing (André Breton and Philippe Soupault); William Burroughs and Brion Gysin developed the cut-up technique, cutting and shuffling texts. Llull's machine, rotating its disks, is the ancestor of all these practices. It introduces randomness into the process of generating a new text, which makes it productive and creative.

And finally – what role does the human play in creativity, is the role of people in creativity? If the thinking machine can generate various combinations and texts, what remains for people to do? Borges's answer seems obvious: what remains is choice. And

so, poets sort through the rhymes proposed by the machine, trying them on for a certain syllable. They do not create out of nothing, out of emptiness; they interpret and evaluate. Creativity cannot arise out of emptiness; it is not creation *ex nihilo*, it is choice from a multitude of possibilities.

The principle of Llull's machine may resonate with modern theories of creativity, which consider creativity as a combination of existing elements in a new way.

CONCLUSION

Jorge Luis Borges's essay “Ramon Llull's Thinking Machine” is not simply a historical account of a medieval invention. It is a deep reflection on the nature of meaning, on the role of randomness in creativity.

Llull's machine, according to the author, cannot be considered a philosophical instrument. It cannot reveal truth, cannot solve a problem, cannot think a single thought. But it works as an inexhaustible source of artistic metaphors. It proves that thinking is a living process, and in this lies its value. From the countless number of metaphors, human artists choose what seems valuable and right to them.

Today, in the era of artificial intelligence, when the world stands a few steps away from the production of real thinking machines, Borges's article becomes an incredible and timely instrument for reflection on the role and interaction of humans and machines.

Llull's machine perhaps does not work in the context of modernity. But it teaches us to think. And, perhaps, this is the most important thing.

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СВЕДЕНИЯ ОБ АВТОРЕ / THE AUTHOR

Екатерина Самородова,
samorodova.ekaterina.78@mail.ru
ORCID 0000-0002-0702-0253

Ekaterina Samorodova,
samorodova.ekaterina.78@mail.ru
ORCID 0000-0002-0702-0253

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