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THE USE OF ARTIFICIAL INTELLIGENCE SERVICES IN GENERATION OF ILLUSTRATIONS FOR CHILDREN'S LITERATURE

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Abstract

This work is devoted to the interaction of artificial intelligence in creating illustrations for children's literature. Rapid advances in artificial intelligence (AI) have transformed creative industries, shifting the designer's role from that of sole creator to that of "manager" who controls AI-based optimization. The relevance of this study lies in the critical role that illustrations play in a child's development – acting as a "bridge" between reader and text for shaping personality and emotional intelligence – and the consequent need for high- quality, ethically sound visual content in educational materials.

The research methodology uses comparative analysis of traditional design and AI-generated illustrations. The practical component included creating a series of black-and-white outline drawings for elementary school textbooks (grades 1–2) and comparing illustrations created by a professional designer using Adobe Illustrator with images created by two AI tools: Large Language Model (LLM), Nano Banana 2, and the visual generation platform Leonardo.ai. To ensure consistency, "engineering prompting" was used, which allowed for a structured request algorithm of six blocks (The Goal, Negative Constraints, Style, Subject, Geometry, and Complexity Control) to limit "creative freedom" AI and compliance with strict technical requirements.

The results indicate that AI services can create contoured illustrations, but retain significant differences between human and machine performance. The Nano Banana 2 tool provided more "cartoon" and detailed results suitable for children, while Leonardo.ai offered cleaner lines but sometimes logical inconsistencies in overlapping lines. The common flaws created by AI included asymmetric forms, unnatural anatomical structures, and visual "noise". By contrast, the human-designed illustrations demonstrated compositional logic, precise symmetry, and stylistic integrity. The study concludes that while generative AI can serve as an "assistant/helper" for creating initial sketches and optimizing workflow, final products now require extensive manual refinement by a professional designer. The results confirm that human and artificial intelligence collaboration is possible, but still depends on the accuracy of requests (prompts) and human control.

Keywords: *artificial intelligence, generative services, children's literature, illustrations.*

Introduction

In recent years, artificial intelligence (AI) tools have been rapidly developed and disseminated resulting in in many areas of activity. The most accurate definition of AI is as follows: they are algorithms, programs that are created to perform specified tasks assigned for optimization, such as creating a picture. As is known, generative services for image creation have become more accessible and relatively easy to use. This has led to the emergence of a mass of AI-generated illustrations that are now easily recognizable. As a result, the role of the designer is gradually and rapidly changing, becoming a *"*manager*"* and AI an *"*assistant*"* that accelerates/optimizes the process of creating sketches or entire images but requires refinements, which are determined by a number of factors. This raises the question of whether this *"*link*"* extends to all categories or can be used only in part.

In this context, the aim of this study is to understand whether generative services can be used in creating narrow-focus images, namely illustrations for children's literature. The object of study is the process of creating children's illustrations.

Methodology and equipment

This research is mainly based on the analysis of existing AI services and their potential for use in creating full-fledged children's illustrations. The practical part is to create the illustrations themselves: in one case as a designer's vision, in the other as an artificial intelligence. Tools such as Adobe Illustrator were used by the artist and two types of AI were taken for comparison.

Presentation of research results (Analysis)

Introduction to artificial intelligence. The term "artificial intelligence" came about much earlier than many assume. As early as the 1930s, there was the first mention of a new "wave" that would lead to technological unemployment, and this will be because we, humanity, are inventing ways to reduce the need for labor faster than we can find use for liberated labor. After a wave of technological progress in the 1950s and the advent of personal computers, "big data" and mass computerization in the 1970s, the world was again at a tipping point, with "forgotten" words about a new "wave" resurfacing. According to John Markoff, right now we are at a tipping point

in the development of computer science, programming, and other fields, after which humanity will enter an era of machines that can replace or even surpass humans in certain characteristics. As noted in several articles, the views of scientists and people may not match, some consider its stage of development and carry out active propaganda, others, on the contrary, declare almost complete denial of its use. There is no precise definition for the term "artificial intelligence", but one might say that the most precise definition would be: a branch of science whose development is closely related. usually, to address specific practical issues aimed at optimization. Artificial intelligence is what radically changes the world and the direction of future change – it reflects the choices and worldviews of its creators.

Illustrations in children's literature. The second important component is illustrations in children's literature. They play one of the key roles: helping to convey the emotional mood of the work, reproducing images of characters and making the objects described "visible", thereby becoming a "bridge" between reader and text. More specifically, in children's literature they help shape the personalities of children, influence their emotional development. Illustrations also attract the attention of children, especially those who are struggling to focus. Subsequently, this led to the formation of a whole direction where drawings became interpretation and illustrators became co-authors whose vision was equivalent to that of the author.

Today, the design of children's illustrations, in line with other areas of design, marks significant transformations, the introduction of artificial intelligence tools is changing traditional approaches. On the one hand, the use of artificial intelligence leads to the optimization of image creation and editing processes, and on the other hand raises questions such as relevance of visual context and work integrity, copyright infringement, Ethics, etc. Defining the coordination of collaboration between artificial-generative services and human creativity is the main direction of modern research on interaction with AI and development of illustrations. At this stage of the introduction of generative image creation services, it can be determined that illustrations created directly by AI are significantly different from those created by humans; they have a number of distinctive characteristics that make them visible to professionals, therefore their results of service generation need further elaboration(s) for further implementation in the product. Many factors are influencing the role of an illustrator, from an artist who creates design from start to finish to a person who must clearly formulate requests for AI services and be able to complete their results. The use of generative services can be seen as an additional resource that optimizes operations and opens up new opportunities. But when working with it, one

must also consider the risks it carries: ethical and legal aspects, integrity, and consistency with content.

Particular attention should be paid to the process of implementing AI tools in developing children's publications. As mentioned above, childhood illustrations are the relationship between a child and the world that helps to understand and learn about things around him, become familiar with the way the world is made, and improve understanding of human norms and actions. It is from this connection that traits of character and early understanding of the environment are formed. The use of light, warm, and "living" drawings, which combine with modern trends towards minimalism, simple forms, collage techniques, and a harmonious combination of drawings, text, and empty space, provides many opportunities to reflect an artist's thoughts. However, in the case of using generative services all the above factors can become a significant obstacle that can be overcome only with correctly created query algorithm. Each such request will differ depending on the age group, type of book, language, style of book (series of books) and other factors; but all must be clearly formulated and have a similar structure.

Practical part. The first task of the practical implementation of this study was to create a series of images for a book, a textbook, to speak more specifically. The publication is part of a large series, so some of the characteristics of future images were already set and known, and it was necessary to take into account the author's wishes regarding the type and approximate styles of illustrations. From the analysis, several key aspects have become clear to consider when creating. First, this edition is a textbook for children in grades 1–2. Second, the images must be black and white, which corresponds to the concept of the entire series. Third, the combination of coloring and infographic elements is the most suitable, as it gives an opportunity for interactivity in the study – a combination not only of visual memory but also of motor development, which is no less important. Fourth, the images should not have complex elements, that is to say be simple but remaining easy to understand and recognize. Fifthly, two styles, realism and "doodle" elements that will give two effects: perceptions of "real" objects that can be seen in reality and help children associate and recognize objects faster, and "cartoon" elements that help the child to engage positive emotions and calm down. The result was as follows: images should combine elements of coloring and infographics, be black-and-white without complex elements, and be in either a realistic or "cartoon" or "doodle" style. Taking into account the criteria above, a number of images using Adobe Illustrator were created, some of which were taken to compare with the illustrations obtained as a result of generations. The selected images (fig. 1) were taken from different

styles and were conditionally divided into three categories: “light”, “medium” and “complex” in creation, which allowed for more precise studies.

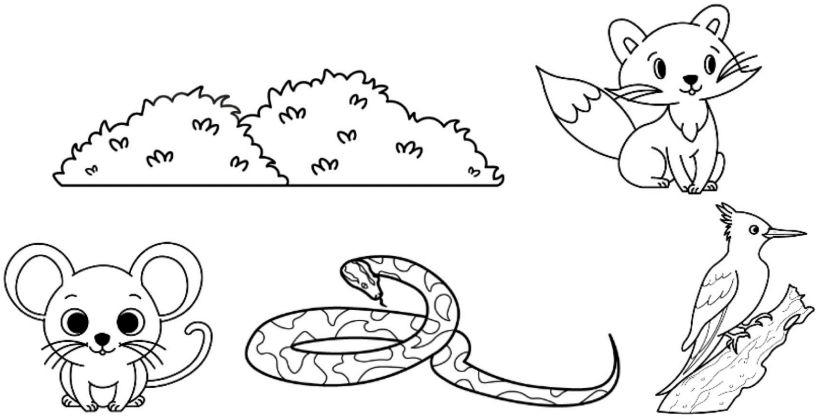


Fig. 1. A series of illustrations created by the artist in Adobe Illustrator

The next step was to select the models of artificial intelligence services that would be used in this phase of research. The main types of AI are generative, analytical and recognizable. As their names imply, they are designed to perform the following tasks: create new content based on requests (prompts); analyze existing data that may find patterns; and for machines to help them “see” and “hear” their surroundings. The generative type of services is suitable for this task and has its own internal division: it is divided into three principles. First, by modality or type of content to be created, it is divided into Large Language Models (LLM), the most common type that predicts the next word and creates text; visual models (Text-to-Image / Text-to-Video), which create graphics or videos based on descriptions; on audio models (Text-to-Audio / Speech) and 3D oriented and spatial models, aimed at generating 3D objects and game worlds. Second, the architecture and principle of work can be divided into diffused so-called “transformers” and adversarial (GANs), which operate according to the following principles: removal of “noise” until a clear image is available, analysis of dependencies in data, and the principle of opposing two networks. Third, the autonomy is divided into traditional (prompt-based) ones that work strictly on demand and agents who can act. Fourthly, the scope of application is divided into general and specialized assignment systems. Based on the analysis carried out and the main parameters of the created illustrations listed above, it was

decided to create images using generative AI of two types, textual and visual, and compare the results obtained.

As a visual system, it was chosen to use the web-based image generation platform Leonardo.ai, and in LLM systems the choice fell on the tool Nano Banana 2, which can also be found in the settings of the first platform, but will be considered as a separate tool in the study. If you compare the models selected, the main difference will be in the approach to creation, with the first being seen as a "professional workshop" for creating images, and the second as an "intelligent sidekick" who can quickly give a hint/result. In terms of the interface and generation settings, Nano Banana 2 is losing out to Leonardo.ai as it only provides information on request, while the platform has customization options using sliders, complex tools, and style choices during creation. Despite such a difference between them, the choice fell on them in the first place because of the given characteristics of the illustrations. As was written earlier, the images must combine elements of coloring and infographics, be black-and-white without complex elements, and be decorated in a "cartoon" or "doodle" style, which means that the pictures are "simple" illustrations, in an artistic sense, and do not require serious settings to generate, for their creation only a clearly structured request (prompt) is sufficient.

For correct generation, it is necessary to formulate an accurate request from the point of view of "engineering prompting", whose structure is aimed at limiting as much as possible the service's "creative freedom" and creating strict technical task framework. The structure of the permeate should consist of 6 key blocks, each one responsible for a specific action. First, the goal and definition of format (The Goal) – "create a vector image (infographic or coloring)" – indicates the format and sets the use of flat borders and clear boundaries, and additionally sets to create empty areas within the contour. Second, the exclusion of negative constraints (Negative Constraints) – "without background and background elements" – clarifies the limits and eliminates the need to spend time on individual objects and complex backgrounds. Third, styling and technique (Style and Technique) – "using only black lines of different thicknesses" which sets technical parameters and gives the image a "live" effect due to different thicknesses. Fourth, the definition of an object (The Subject) – "which, shows one object, namely – "something", which gives an accurate representation of the subject. Fifthly, geometric parameters (Geometry and Form) – "which has smoothed corners, semicircles, and rounded contour shapes", which describes the aesthetics of the shape and guarantees a minimalism suitable for this theme of illustration. Sixth, the level of detail (Complexity Control) – "without using com-

plex elements inside in doodle style/ no complex elements inside in doodle style", which sets the final limiter and final "strokes" that combine all previous instructions into a single visual code. Thus, the most suitable design for this series of images has the following structure and text: purpose and definition of format (The Goal) / exclusion of unnecessary (Negative Constraints) / styling and execution technique (Style and Technique) / object (The Subject) / geometric parameters (Geometry and Form) / level of detail (Complexity Control) – "create a vector image (infographic or coloring) without background and background elements, using only black lines of different thicknesses, which shows one object, namely a – "object", which has smoothed corners, semicircles and rounded contour shapes and no complex elements inside in doodle style". Using the generated request (prompt) two rows of selected images were created (Fig. 2–3).

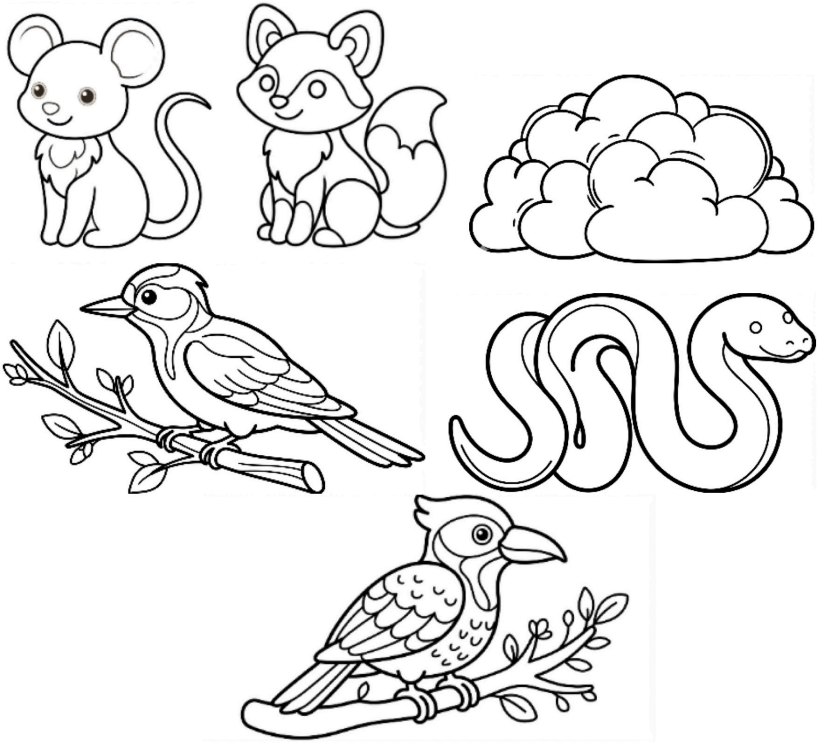


Fig. 2. Series of illustrations created by the Nano Banana 2 tool

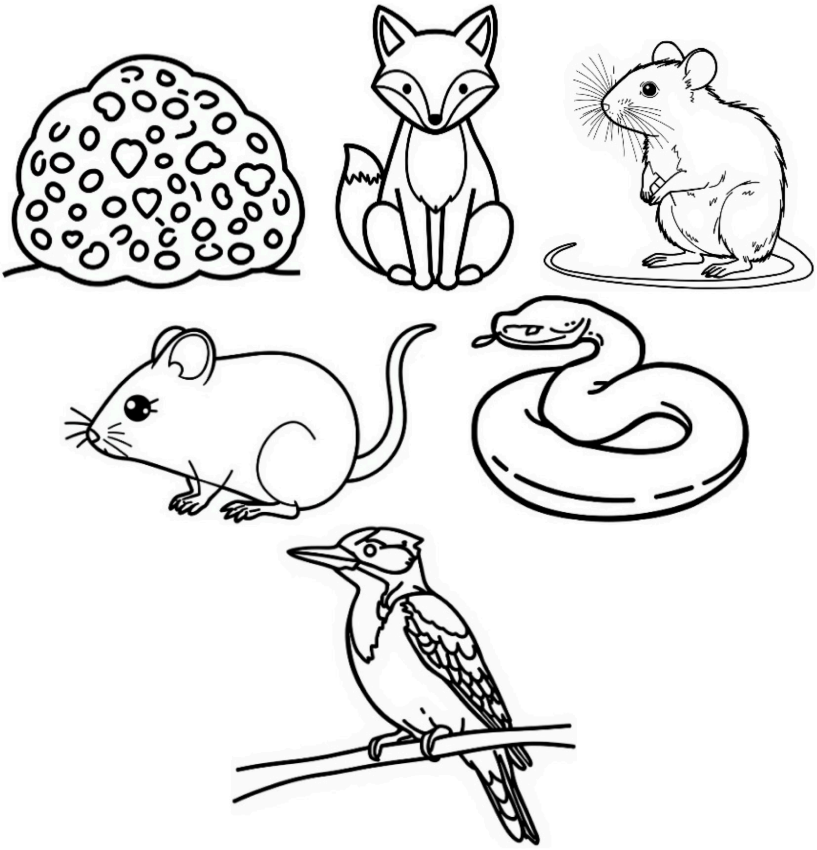


Fig. 3. Series of illustrations created by the service Leonardo.ai

Conclusions and practical implications

After analyzing the images obtained from two generative models, a number of conclusions can be drawn. If you compare the generated images with each other, you can see some similarities, which confirms the structure of the query; both are contour drawings, but there are also important differences. The drawings created by the Nano Banana 2 tool look more childish, "cartoonish" and more detailed in terms of internal patterns (leaves on the branch, fleece of foxes and feathers), you can also notice the unnatural structure of the paw (if you compare the image of a mouse). The pictures created by the service Leonardo.ai have "cleaner" lines, sometimes too simplified or, on the contrary, excessively detailed (the bar on the mouse or the number

of feathers on a bird), also not quite logical curves and the overlap of the lines on each other are observed. When using two types of services, common drawbacks have been noted: the generation of one object on the same request can be of a different kind each time, there may be cases when object is in "object" You have to write a fairly extensive description of the object and emphasize its similarity with real objects, also there may be situations when tools overlay or mix images with each other, which was particularly noticeable in the images generated by Nano Banana 2.

If one compares the generated illustrations with those of authors, one can see clear manifestations of "human" design. First, the logic in the composition – the same stylistics is seen in the thickness of the trim lines and the "manual" refinement of the elements. Secondly, the exact symmetry of objects is observed, whereas slight asymmetry can be observed in the generated illustrations. Third, they look like "finished" or integral elements in which there is no unnecessary "noise." All the generated illustrations can be used as sketches or "bases" for future images, but they require careful refinements such as removing "unnecessary" elements, fine-tuning outlines, correcting unnatural structures of objects, etc.

This way you can make a summary that it is possible to draw the following conclusion: the generated images demonstrate the possibility of using services when creating contour illustrations; for this task, the work of the Nano Banana 2 tool can be considered more suitable, as they have more a "cartoonish" look, which is more suitable for children's literature, but also very visible their shortcomings and errors, which require detailed correction. The results confirm that AI services can be used as an "assistant/helper" in the process of creating sketches of children's literature illustrations at creation. At the same time, suspicions were confirmed that they would require serious "manual" revisions, which would take quite a long time depending on the style and degree of detail of the obtained pictures.

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