Possibilities of Gen AI in the Development of the Design of Central Bank Cash Paper for the Central Bank AI Conference, Held as Part of Payments, Innovation and Technology Week, Organized by Currency Research September 23-26, 2024

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Abstract
Cryptobanknotes are an evolution of central bank cash.

In the process of developing the design of cryptobanknote, the need arose to use Artificial Intelligence.

This interesting experience allowed to evaluate the capabilities of Artificial Intelligence in developing the design of central bank cash, as well as to identify the advantages and disadvantages of using AI.

It was found that it is absolutely impossible to generate completely ready-made security graphic elements for a banknote design using AI, and the conclusion was made about the impact of Artificial Intelligence image generation on the degree of security of central bank cash.

Introduction
Queen Nanny (or Nanny of the Maroons) was the leader of the Jamaican maroons (runaway African slaves) in the 18th century. Under Nanny's leadership, the maroons fought a guerrilla war against British authorities in the colony of Jamaica for many years.

According to the legend of the maroons, Queen Nanny was born in Jamaica and was the daughter of Prince Naquan of the Asante tribe, who was captured as a slave by the Spanish in what is now Ghana in 1640.

In 1655, a naval expedition by the English fleet led to the capture of the island of Jamaica from Spain. Slaves who escaped from Spanish-owned plantations joined pre-existing Maroon groups. Together they organized a guerrilla war against English subjugation and enslavement.

During the war, the British suffered significant losses in clashes with the Maroons of eastern Jamaica. The Maroons' skill in guerrilla warfare played a significant role in their success. Having failed to defeat them on the battlefield, the British sued for peace, signing a treaty with them on April 20, 1740. The treaty ended hostilities, granted state-sanctioned freedom to the Maroons and 500 acres of land on which Moore Town (New Nanny Town) was built.

In 1975, the Jamaican government declared Nanny a national hero. A bust of Nanny of the Maroons was unveiled in Holywell, at the Blue and John Crow Mountains National Park.

Bust of the National Hero of Jamaica – Nanny of the Maroons

Every Jamaican $500 Bill Features a Portrait of Nanny.

Obverse of the 1996 Jamaican 500 Dollar Banknote

Obverse of the 2022 Jamaican 500 Dollar Banknote

:Nyan-ko-pong: is the modern Maroon national community. By virtue of the Declaration on the Rights of Indigenous Peoples adopted by the UN General Assembly in 2007, :Nyan-ko-pong: wished to exercise its national autonomy in full accordance with these rights. In this regard, the :Nyan-ko-pong: government was elected and the goals of economic, social and cultural development were outlined, for the implementation of which it was decided to create its own money based on the ODUWA Blockchain.

In this regard, the development of the design of the 100 Maroon ODUWA cryptobanknote using Artificial Intelligence began.

Cryptobanknotes are the next blockchain-based generation of central bank cash with incredible potential [1].
Therefore, it is not surprising that cryptobanknotes may be the first cash to be designed using Artificial Intelligence.

Obverse of the 100 Maroon ODUWA Cryptobanknote

Reverse of the 100 Maroon ODUWA Cryptobanknote

Using AI to Generate Graphic Elements
The design of the 100 Maroon ODUWA Cryptobanknote is dedicated to the history of the Maroons' struggle for their freedom in Jamaica in the 18th century.

There are practically no graphic materials telling about the confrontation between the Maroons and the British. Therefore, it was decided to use the ability to generate images using Artificial Intelligence. At the same time, the task was to preserve the historical identity of each image as much as possible. Therefore, photographs of museum exhibits were used as historically significant details of each image, such as, for example, flint or edged weapons of the 18th century, the Maroon sound warning device (Abeng), etc.

A bust of Queen Nanny, erected in honor of Jamaica's flamboyant national hero, has been brought to life by AI-powered photo editor.

Bust of Nanny of the Maroons   **AI-Generated Image of Nanny of the Maroons**

During the training of Artificial Intelligence, a rare archival photograph of maroons was used to generate images of maroons:
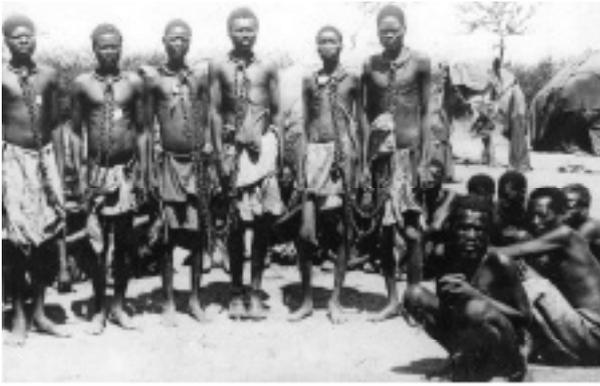

Jamaican maroons   **AI-Generated Jamaican Maroons**

During the training of Artificial Intelligence, documentary photography was also used to generate images of African slaves:

African Slaves   **AI-Generated African Slaves**

Jamaica was in Spanish possession until 1655. Moreover, the first African slaves were brought to Jamaica by the Spaniards in 1517. Therefore, images of Spanish soldiers and carrack of the 16th-17th centuries were additionally generated.

AI-Generated Spanish Soldiers

AI-Generated carrack of the 16th-17th Centuries

During the generation of images of soldiers and maroons, the main problem of Artificial Intelligence appeared like a litmus test - a complete misunderstanding of the principles of construction and operation of any mechanical devices, in particular firearms, as well as a lack of understanding of the features of the evolutionary stages of development of these devices.

That is why Artificial Intelligence generates strange devices (images of a bow or edged weapon, seamlessly combined with the image of a flintlock pistol/musket), flintlock guns with magazines for cartridges, bandoleers that are absolutely inappropriate when using flintlock guns, and filled with something unknown instead of cartridges. Artificial Intelligence jumps over eras and generates medieval people in modern uniforms and with weapons similar to modern weapons.

Image Errors Generated by Artificial Intelligence

During the learning process, before achieving an acceptable result, the AI generates strange images of people.

AI generates Strange Images of People

Abeng - a bugle made from the horn of a bull, which the maroons used to transmit sound signals warning of the approach of the British, has remained an unresolved mystery for Artificial Intelligence.

Abeng

AI-Generated Abeng

Despite the problems and difficulties encountered during the generation of weapon images, Artificial Intelligence copes quite well with landscape generation. The Caribbean Sea and the sandy coast of the island of Jamaica, as well as the medieval fort, turned out almost perfectly.

AI-Generated Sandy Coast of Jamaica

AI-Generated Medieval Fort and Carrack

A high-resolution scan of a geographical map of Jamaica from the 18th century was used as the map image.

Geographical Map of Jamaica in the 18th Century

A sketch of the general placement of graphic elements (collage) of the obverse of the cryptobanknote was also generated by Artificial Intelligence.

AI-Generated Collage Sketch

Conclusion

Of course, existing AI capabilities for banknote design are still quite weak.

It is absolutely impossible to generate using AI completely ready-made security graphic elements of a banknote design, such as engravings, for example.

AI can only be used to generate initial (raw) graphic materials. Moreover, one must be prepared for the fact that between the AI-generated image and the finished graphic element that can be used in the design of banknotes, there will be a huge amount of manual work by the designer. And only after this significant improvement will it be possible to further process the graphic element using specialized software and turn it into a protective graphic element.

The author has the courage to suggest that the frank weakness of Artificial Intelligence in technical design is only a special case of the general low level of AI development. Therefore, in any area of application of AI, a mandatory thorough check by an expert of the product created by AI is required.

It is important to understand that when using images generated by artificial intelligence, the degree of security of banknotes does not decrease. After all, each generated image will subsequently be processed into a full-fledged engraving using specialized software, which guarantees proper protection against partial and/or complete counterfeiting for both conventional photographs or slides, and AI-generated images.

Unfortunately, at this stage of development, artificial intelligence will not greatly simplify the task of a banknote designer. However, already now, Gen AI will significantly expand the imagination and horizon of the designer's capabilities.

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References
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