Digital Musical Synthesizer with Artificial Intelligence: A New Field of Musical Possibilities

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***Abstract*— Digital musical synthesizer with artificial intelligence: a new field of musical possibilities is the direction that people all over the planet are currently concerned about: from professional musicians, musical sound engineers, composers and performers of music in various genres; from music teachers in various educational institutions to students and their parents; from producers to listeners - music lovers. This article attempts to identify the most significant aspects of the use of artificial intelligence in music and related phenomena from the point of view of the authors.**

***Keywords*— Artificial Intelligence (AI), Digital Musical Synthesizers, Music Computer Technologies (MCT), Musical Education, Musical Creative Work.**

I. Introduction

As artificial intelligence (AI) develops, so does its potential in creative fields, one of which is the music industry. With the development of music computer technologies (MCT), musicians have gained access to a variety of powerful AI tools that help them create, process, and analyze music. These tools are suitable for both beginners and professionals, helping at every stage — from melody writing to final mastering. However, the attitude towards AI in the music field is ambiguous. Some support the technology and use it themselves to generate songs and music videos. Others are against it and are suing the authors of neural networks. This process has been observed many times before (for example, the history of the creation and formation of Melotron-Chamberlin).

The latest trend introduced by AI in the music industry is composing music using machine learning algorithms. Despite the fact that «artificial» music is still far from the works of great classics, algorithms have already managed to achieve amazing results.

II. Popular AI tools

A. AIVA (Artificial Intelligence Virtual Artist)

AIVA is one of the first AI composers specializing in creating musical compositions in various genres. With AIVA, musicians can create original compositions based on preset settings, such as genre, tempo, or instrumentation. AIVA offers both ready-made musical fragments and inspiration for further development of compositions. This tool will be useful for soundtracks, music accompaniment for video games, movies and other projects where fast music generation is needed.

AIVA also supports the MIDI format, which allows musicians to export the generated melodies to any DAW and edit them in detail.

B. LANDR

LANDR is an artificial intelligence mastering platform that automatically processes a track, giving it a more professional sound. Through dynamic and frequency range analysis, LANDR can offer the optimal balance typical of professional studios. This tool is indispensable for musicians who do not have the opportunity to use professional mastering studios. In addition, LANDR helps with the distribution of tracks to popular music platforms such as Spotify, Apple Music and others.

C. Melodyne

Melodyne is an advanced AI tool for editing vocals and other musical parts. The program recognizes each note in a recording, allowing you to change its pitch, duration, volume, and even key. Melodyne is useful for correcting intonation and rhythm, especially if the vocals are recorded with small errors. AI helps to keep the natural sound and avoid the «metallic» effect that often occurs when adjusting the sound.

D. iZotope RX

iZotope RX is an audio recovery and cleaning tool that is great for processing live recordings or correcting recorded tracks with noise. With AI, the RX can automatically detect and eliminate noises, clicks, hum, and other unnecessary noises. This tool is especially useful for producers who work with low-quality recordings and want to bring their sound to a professional level.

E. Soundraw

Soundraw is focused on creating unique and original music for use in videos, podcasts, and other media projects. It allows the user to select the mood, genre, and tempo of a track, and then generates a song based on those preferences. Soundraw is useful for video bloggers, producers, and content creators who need exclusive music for projects without having to obtain a commercial license.

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F. Ecrett Music

Ecrett Music allows users to create background music for videos and games. You can use it to select the mood, genre, and duration of a track, after which the AI generates music that matches the set parameters. Ecrett is convenient for content authors and musicians who need fast music generation. The tool also offers a user-friendly interface and supports audio export in various formats.

The popularity of AI is growing as new tools become available. Dozens of neural networks are already on the market, tailored to the needs of musicians and their teams. So, to create or process music, you can use MusicGen, BandLab, Boomy AI, Loudly, Sounddraw, etc. They all work on the same principle: the user enters a text query like «Write me a song about the moon» and gets a ready melody. One of the most famous tools is Google's Gemini. You can use it to create tracks, analyze existing recordings, improve the sound quality in finished fragments, add sound effects to them, and much more.

III. Basic approaches

There are neural networks that help you write lyrics. For example, in 2023, the Argentine data analyst Matti Gatti introduced the Keyword To Lyrics tool. It was the result of learning the OpenAI GPT-2 language model based on popular compositions of the XX and XXI centuries. Vocal synthesis and voice processing solutions are also being developed. One of the very first and well—known in this field is the Vocaloid program from the Japanese company Yamaha Corporation. In addition to it, the services Supertone, Uberduck, Voicemood, etc. are popular. All of them are able to create new voices based on preset parameters, as well as clone existing ones.

However, it is worth noting that despite the extensive capabilities of the services, many foreign musicians continue to be skeptical about the technology. Some performers are of the opinion that AI deprives music of humanity. The artists are also worried about the copyrights of the compositions. So, more than 200 world stars have written an open letter against the unreasonable use of generative AI. In particular, they condemned companies that train neural networks on tracks without the consent of the authors.

In Russia, according to a survey of 300 artists, producers, and label owners, «over half of the players are interested in, but have never used AI to create music. But almost half of them experimented with neural networks in one way or another: 17% of respondents combined musical compositions with their help, 21% generated music and individual sounds, 26% synthesized vocals or processed the voice» [16].

What does it mean in this process to «use» a digital musical instrument – a musical synthesizer in the process of using AI systems?

In today's fast-paced world, the landscape of music and music computer technologies (MCT) is undergoing a transformational revolution [5; 7; 10; 17-18]. The field of musical instruments is no exception: keyboard digital musical synthesizers are at the forefront of this innovative wave [9; 23]; in vocal pedagogy [3], in the system of distance musical education and the creation of digital interactive programs (see, for example, in the works [8; 11]). What is the future of digital musical instruments? It is necessary to conduct the broadest in scope and depth research on new musical instruments and revolutionary innovations that are changing the way we perceive and create music ((see more in the works [1-2; 6; 12-14; 19; 21]).

Ushering in a New era of sound: A new definition of digital musical instruments

Gone are the days when the piano was limited by its acoustic roots. The keyboard digital musical synthesizer has overcome these limitations, becoming a center of creativity and inspiration for both novice musicians and experienced professionals. Thanks to advances in sound sampling technology, the digital keyboard musical synthesizer now offers a surprisingly authentic and rich sound that can compete with its traditional counterparts. Imagine the resonance of a piano filling a room, carefully captured and reproduced with unprecedented precision.

The Key to Self-expression: The Art of realism in key actions

The tactile sensation of pressing the keys has always been a defining aspect of playing the piano. Today, digital keyboard musical synthesizers are equipped with a sophisticated keyboard control system that mimics the feel and feel of an acoustic piano. Regardless of whether you prefer the responsive touch of weighted keys or the subtle expressiveness of hammer-like combat, modern keyboard digital musical synthesizers offer a range of features that meet the most unique playing style.

Creating soundscapes: versatility and sound customization

One of the most remarkable features of digital musical instruments is their versatility in creating a diverse sound that goes beyond traditional piano timbres. Digital musical instruments, from symphonic strings to jazz saxophones, give musicians the opportunity to explore a variety of sounds and styles, all at their fingertips. Advanced sound customization allows you to model and change timbres, giving you the freedom to create a personalized sound palette that matches your artistic vision.

Integrating AI into the process of musical creative work: a musical collaborator

The fusion of digital musical instruments with AI has opened up a whole new realm of musical possibilities: when we compose a piece of music, an AI companion offers harmonies, melodies, and chord progressions that complement your creation. With AI—driven accompaniment and composition tools, digital musical instruments are no longer just instruments; they are collaborative partners who inspire and uplift the musical path.

Enhanced learning and skill development

Learning to play the piano has never been more accessible and exciting. Keyboard digital musical synthesizers are equipped with interactive learning features that help beginners complete lessons and practical exercises. Visual aids, interactive tutorials, and instant feedback mechanisms speed up the learning process and allow novice pianists to effectively hone their skills.

Seamless integration in the Digital age: Connectivity and performance

The digital revolution has brought unprecedented connectivity, and digital musical instruments are embracing this trend with open arms. The ability to connect via MIDI and USB provides seamless integration with computers, tablets, and recording equipment, allowing you to easily record, edit, and share your musical creations. Regardless of whether a musician performs on stage or produces in the studio, digital musical instruments make it possible to achieve flawless and exciting performance. In this regard, the opinion of K. A. Tsaturyan, a musician-performer on digital musical instruments, pianist, author-performer and compiler of the anthology *Two Centuries of the Piano Study*, recorded on a double DVD, deserves special attention. (For more details, see Tsaturyan's works. For example, in the paper [22] and many others: [15])

Sustainable development and space saving

In a world that is increasingly concerned about sustainability, digital musical instruments offer an environmentally friendly alternative to their acoustic counterparts. The lack of tuning, lower maintenance requirements, and lack of traditional piano components make keyboard digital musical instruments a contribution to a greener future. In addition, their compact and compact design makes them a practical choice for urban residents and people with disabilities [4; 19].

Journey Forward: Embracing Evolution

The future of digital musical instruments is a symphony of innovation, creativity and limitless potential. As technology continues to evolve, we can only expect even more remarkable developments on the horizon. Striving to expand the boundaries of possibilities that expand musical and creative endeavors is a step into the world of tomorrow with digital musical instruments, which surpasses all expectations and reveals the creative abilities of musicians: composers, performers, sound engineers, students of children's music and secondary schools, producers and visual media figures, and many other newly emerging fields of professional activities., widely demanded in the media industry.

IV. Conclusion

With the development of artificial intelligence (AI), its potential in creative fields is also growing, in particular in music and in teaching various musical disciplines, including playing and performing on digital musical instruments. The latest trend introduced by AI in the music industry is composing music using machine learning algorithms. Despite the fact that "artificial" music is still far from the works of great classics, algorithms have already managed to achieve amazing results. This article reviews some of the currently existing methods of using AI to compose music and various relevant projects ranging from startups to products from technology giants. A special role in this process belonged and still belongs to modern MCTs, an essential element of which are digital musical synthesizers.

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