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VR ART

Abstract: Compared to previous years, virtual reality has recently developed at an unprecedented speed. Philosophers have also noted the importance and philosophical dimension of Virtual Worlds, as well as their potential for the arts, as VR plays roles similar to physical reality and may be freely created. For years, artists have been interested in VR as a medium which is possible to use in the creative process and/or for exhibiting purposes. Several dimensions of VR art led me to distinguish, first of all, works functioning in physical space or hybrid works whose VR meanings are interpreted and developed as a phenomenon, and, secondly, VR works in their literal and fundamental meaning – art projects created with the intention to appear in virtual reality that is meant to be an exclusive space for their functioning. Additionally, you may have noted a few artworks or structurally linked projects inspired by the concept of the Metaverse. The paper examines selected examples of VR art and ontological components of their realities through which art penetrates and from which artworks emerge in ways that are not possible in the real world.

Keywords: new media art, virtual reality, NetArt, Post-internet Art, virtual gallery

From Media to VR

Recently, interest in electronic media has grown significantly and dominated the world of art, becoming an area of artistic exploration or a code of media transgression:

"Nowadays all of art practice keeps to the script of the media and the rules of the media. This notion of the media comprises not only the old and new technical media, from photography to computers, but also the old analogue media such as painting and sculpture which have been transformed and influenced under the pressure of the technical media. This explains why we can rightly say that all of art practice keeps to the script of the media."[1]

The statement above may have further consequences, which leads to the question whether we may name such a medium which could drastically develop and turn the post-media mosaic into a paradigmatically oriented singular medium prevailing other ones. As Lev Manovich noted, the Web is still becoming an increasingly influential medium which develops autonomously and creates opportunities to absorb other media. It could also take in a variety of content and change its form in its own way. Obviously, you could not exist without activity on the Web, so the Web has become an evolving structure which is necessary for everyday life:

"Within the space of this article I can't begin to develop a new conceptual system which would replace the old discourse of mediums, and which would be able to describe post-digital, post-net culture more adequately. However, what I can do is to suggest one particular direction we may want to pursue in developing such a system. This direction would involve substituting the concept of medium by new concepts from computer and net culture. These concepts can be used both literally (in the case of actual computer-mediated communication) and metaphorically (in the case of pre-computer culture)."[2]

My intention is to go further with my investigations into the development of cyberculture in order to analyse the evolution of the Web, i.e. the phenomenon of the emergence of a new form of VR Internet in which a flat image of computer display shall be replaced with 3D and circular space, virtual reality, which could be accessed using such equipment as a head-mounted display, e.g. Oculus Quest. In the past, the Web was a fundamental medium among the electronic media, while nowadays virtual reality is in the lead. The evolving Web could create a form which resembles the human world best, owing to which it

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[1]   Peter Weibel, "The Post-Media Condition", *Mute* (2012): https://www.metamute.org/editorial/lab/post-media-condition (accessed: 23.09.2022).
[2]   Lev Manovich, "Post-Media Aesthetics", (2000): http://manovich.net/index.php/projects/post-media-aesthetics (accessed:23.09.2022).

is close to man. It is possible that, in some aspects, virtual reality is better than the physical world or at least more functional and attractive:

> "Virtual worlds are not illusions or fictions, or at least they need not be. What happens in VR really happens. The objects we interact with in VR are real. Life in virtual worlds can be as good, in principle, as life outside virtual worlds. You can lead a fully meaningful life in a virtual world. The world we're living in could be a virtual world. I'm not saying it is. But it's a possibility we can't rule out."[3]

Similar debates have included such topics at least since the beginning of the 1990s. Therefore, we could trace how virtual reality acquired more and more *features of the real world* with the course of time. You could also refer to Deleuze's claim: "By contrast, the virtual is not opposed to the real; it possesses a full reality by itself".[4] It grew in importance with the development of new technologies and, finally, the electronic form of being in the shape of virtual reality as we know it today (e.g. Metaverse[5]) emerged. New philosophical questions regarding the comparison and replacement of objects from the physical world with virtual objects, and the creation of objects which could not be created by artists in the physical reality have risen.

My goal is to define virtual reality art, in contrast to physical space, as a form of art created exclusively in virtual space where it could be experienced thanks to appropriate equipment. VR ART may be understood as an answer to the question *what the nature of art is* and a proposition to seek new and original spaces, as it is a contemporary medium which is to intensely develop in the near future. I characterise VR art as a form of space art and/or *artistic environment* where all the components, including specific objects and/or people, appear in the artistic dimension and contribute to the total dimension of the virtual venue. VR ART has the potential to cross physical restrictions, whereas the imagination of the artist may be the only boundary, and the technology used to create artworks is the artistic tool. This form of art may serve as a tool to create artistic spaces which are like contemporary cities and/or nature. VR ART may be seen as the culmination of the development of historical types

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3   David Chalmers, *Reality+ Virtual Worlds and the Problems of Philosophy* (W. W. Norton & Company, Inc., New York 2022), xiv.

4   Gilles Deleuze, *Difference & Repetition*, transl. Paul Patton (Columbia University Press, New York 1994), 211.

5   Eric Sheridan, Michael Ng, Lane Czura, Alexandra Steiger, Alex Vegliante, Katherine Campagna, *Framing the Future of Web 3.0 – Metaverse Edition* (Goldman Sachs Research, December 10, 2021), 4-5: https://www.goldmansachs.com/insights/pages/gs-research/framing-the-future-of-web-3.0-metaverse-edition/report.pdf accessed (23.09.2022).

of art because it uses them in a coherent way, uniting their forms of expression in a new totality as an artistic space. VR ART is created in virtual reality as an alternative form to the physical world and, if it is the artist's intention, it is possible to create the highest level of the mimetic world, or unbind the restrictions of the material world due to VR ART's potential to create abstract and fantastic worlds.

A good example showing the problems of parallel physical and virtual worlds is the artwork of a Polish artist Maciej Gniady entitled *Słoń [Elephant]* (2019).[6] The exposition space was in the form of an empty room where there was a virtual elephant which could be visible only when the recipient put on VR goggles. Remote control devices were installed inside the room, scanning the space to trace the behaviour of the audience. A computer displayed an image of the elephant for the viewers, which trembled when the remote control devices were touched. The virtual object was revealed after the appropriate technology was applied and the physical space was used for two types of reality – physical and virtual, according to needs, allowing the two separate worlds to co-exist in this way. The cognitive context was also important in this work, as its basis was the Hindu allegory about the blind men and the elephant. In this story, six blind men touched different parts of the animal and each of them made statements about it in a different way. The meaning of the artwork seems to be that reality is not simple and, apart from that, the author advances the concept of multidimensional reality, in this case showing the reality of the physical world and electronic virtual world, respectively.

What is interesting for me in the abovementioned example is the alternative character and separateness of physical and virtual worlds which sometimes coexist and sometimes are independent from each other. Another artwork involving VR, entitled *In Between Nodes* by Razieh Kooshki and Vahid Qaderi, was presented at Ars Electronica 2021.[7] The artists reflected on the phenomenon of virtual reality which they showed as an unlimited space allowing for a never-ending journey and including the repetitiveness of crossing from one virtual world to another. Initially, the viewer put on a physical HTC Vive headset and then was supposed to find goggles in the virtual space. When they were found, the viewer took them in hands using remote controls and put them on the head in the virtual world. Then, they moved to another virtual space. The procedure was repeated and, as a co-worker of Razieh Kooshki said in a documentary

[6]   Information on the "Słoń" artwork by Maciej Gniady (WRO 2019 Festival): https://wrocen-ter.pl/pl/slon/ accessed (23.09.2022) and information from the documentary published on Vimeo: https://vimeo.com/322584349 (accessed:23.09.2022).

[7]   Razieh Kooshki, Vahid Qaderi, *In Between Nodes*, a documentary film on YouTube: https://www.youtube.com/watch?v=CLZZwaKeBuw (accessed:23.09.2022).

film, there was a virtual world in another such world, then in the next one, etc. Apart from the aesthetic dimension related to the creation of successive and different virtual worlds, this artwork includes a philosophical motif which is used by the artist to pose a question on the virtual nature of the physical, the possibility of cognition and assertion of its existence in the manner proposed by Nick Bostrom:

> "As one approaches the limiting case in which everybody is in a simulation (from which one can deductively infer that one is in a simulation oneself), it is plausible to require that the credence one assigns to being in a simulation gradually approaches the limiting case of complete certainty in a matching manner."[8]

These artworks involve eternal questions on the subject of what reality is and how it exists. Crossing the boundaries from one part of *In Between Nodes* to another, repeating the same pattern, may also arouse a form of nostalgia due to the experience of the physical world which goes away from us. The final photo representing physical goggles is linked with the emotion of returning to the physical world, though you may recall a fragment of the description of this artwork published on the Ars Electronica website: "Is it real, just a dream, or a designed virtual space?"[9]

Substitution and Creation of the "Impossible"

There are two types of VR artworks. The first one includes singular venues which create personal spaces that are not linked with any broader issue and/or project. They are most often refined works which comprise stage design, architecture and design components, and each of them contributes to a separate totality. Frequently, they are not large spaces, but they have a crucial point in the form of a small garden, a campfire and/or a home. Their ambiance is recognisable and they are not inclined to render a specific target. Such artworks may include motifs transferred to the virtual world, e.g. artists' artworks and/or photogrammetric works, or 360° scans of objects coming from the physical world. The second type of works are hubs which are more complex and whose functions seem more complicated, as they have a crucial point accumulating teleports transferring viewers to other places. They are most often a structure of venues linked by teleports, created by many artists. They seem more meaningful

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8   Nick Bostrom, "Are You Living in a Computer Simulation?", *Philosophical Quarterly* (Oxford Univeristy Press, 2003), Vol. 53, No. 211, 251.

9   The Ars Electronica website assigned to *In Between Nodes*: https://ars.electronica.art/newdigitaldeal/de/interface-cultures/ (accessed:23.09.2022).

than singular projects because they aspire to be recognised as communication centres inducing the viewers to further explore and/or collect the teleports.

I have found the first type of works in the virtual world of Altspacevr. An example of such a work is the island named *Simple Beauty* (by Optic). It is a romantic garden illuminated with the contrast of whiteness and navy blue, inside which there is a tiny transparent building serving as a starting point for the visitors who may initiate a small walk around this building for several dozens of meters. This place is totally covered with white flowers and there is also a path leading through the centre and around a lake. The whole work is in the colours of the sky at night and is accompanied by a song by Leonard Cohen, *Hallelujah*. In an analogous way, the island is composed by the same artist, but this time it is a meadow brightly illuminated and filled with colourful flowers. While I was visiting this place, I came across two couples who were surely having virtual dates. This situation completed the meaning of those gardens and fulfilled its artistic sense, showing that such a romantic environment perfectly serves people who wish to be closer to each other. This adds magic to such meetings. By substituting non-virtual reality, venues like this give them ambiance which is exceptional and sometimes impossible to achieve in the physical world.

Among several art galleries which I visited in the virtual world, I came across a Polish art gallery under the name *VR Art Gallery* (by Robo) which organized a painting exhibition on the subject of ballet, *Dancing Worlds II* by Kamila Sitak, who authored a vast majority of the works, and Jerzy Maciej Koba. There, I also had an opportunity to encounter one of the organisers who presented future plans for the gallery and talked about cooperation with other people, and their commitment to the activity of the Rotary club, which reveals further links with physical and virtual reality:

> "Many of our artists are members of the Rotary club, and our colleagues often support our projects by donating their works for charity auctions. Together, through the support of our fellow artists within Rotary, we can create joint projects that increase the recognition of our Rotary Club as an organization, especially in the areas where Rotary is not well present, on the country level, and help our artists build their names. Our Fellowship will encourage an exchange of experiences and creating a new artistic value. The Fellowship is open to all fields of Art, painters, musicians, photographers, art galleries and their owners, curators and art lovers, from every club, city, country, or continent."[10]

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[10] Altspacevr website on VR Art Gallery: https://account.altvr.com/worlds/14311531383577-64130/spaces/1695051837675143670 (accessed:23.09.2022).

Finally, I found a place named *Building Tour Integrated Science and Engineering Laboratory Facility* (ISELF) which is part of University St. Cloud (by Karnivore). This place is an example of a comprehensive use of virtual reality. A large and mounting spiral runway which allowed visitors to reach higher levels attracted my attention just at the entrance. Animated and revolving equipment consisting of gear wheels was placed under the vault. Silver balls were installed at side lugs, allowing visitors to feel as if they were in another virtual world. Visitors could move on in their 3D space, which was possible due to spherically curved textures placed in balls which reflected e.g. workplaces, or a prolonged perspective of university halls, lecture rooms or labs. Apart from the balls, you could encounter textures with photos, hung like paintings in different places, optically extending the virtual space. The whole work seemed both a multidimensional composition and a coherent entity.

Hubs are the second type of virtual artworks. One of them, which is very popular, deals with the *Burning Man*[11] Festival. It was held on Altspacevr from 29th August to 7th September 2021, on a virtual desert in Nevada where thousands of avatars appeared. Dozens of artworks of various volumes were created there, and the lines of teleports which directed visitors to new venues with more artworks to admire were seen from far away.[12] The hub comprised over 300 venues around the virtual centre which was the place of the main organiser's BRCvr hub which gathered the community of official representatives of the *Virtual Burning Man Experience*[13] in the virtual world. Due to the pandemic, this artistic action moved to Altspacevr, which nevertheless contributed to the new form of the festival that surely brought satisfaction from artistic creativity and expositions, and became a source of inspiration for artworks which could be impossible to a large extent in the physical world. The festival not only ga-

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[11] Since 1986, *The Burning Man* Festival has been the centre for a variety of artistic actions with the participation of thousands of contributors. In 2021, it was held in the virtual world of Altspacevr (https://brcvr.org/rsvp/) for the first time, when the Nevada desert was opend there. The festival includes a variety of artistic actions of which the most popular one is the burning of a big puppet: https://burningman.org/ (accessed:23.09.2022).

[12] "Taken in isolation from the rest, neither the individual pieces of art, nor the people that gather in Black Rock City can be considered as unprecedented or particularly transgressive. It would be almost too easy to dismiss the artwork as amateurish, and the people as mere ravers. We have instead opted for taking Burning Man as a whole, as a *total work of art*, to be studied in relational terms." (Selçuk Balamir, "More Than Dust: The Burning Man Festival": https://www.academia.edu/1478249/More_Than_Dust_The_Burning_Man_Festival) 23.09.2022).

[13] The website of BRCvr: https://brcvr.org/ and the website of Protocol, where the description of the Burning Man can be found: https://www.protocol.com/brcvr-2021-burning-man-vr (23.09.2022).

ined applause in the virtual world, but moved there for good. The organisers have announced its next VR edition in 2022, but this time it will be devoted to films. For the purposes of this paper, I returned with Oculus equipment to the virtual desert in Nevada, and although there were fewer people than during the week when the festival was held, the place *Main Playa* and dozens of other places were still active, and visitors were directed to them using teleports in operation. Like previously, the range of the still exhibited artworks was striking. You could concentrate on large-size works or small installations and emanating individualised simplicity allowing for a moment of contemplation. In some cases, you could surrender to the interactive effect of the works, as with *Astral Hikari* in which the visitor entered the centre of an abstract, dynamic and immersive environment. In the case of *Liminal Zone*, you could fly and explore fragments of the installation, separate and far away from each other, located in virtual spaces and, at the same time, play one of those components which resembled dulcimers or tubular bells. When approaching *Deep Art Zone*, you could encounter *Museum of No Spectators* where paintings, collages and graffiti were on display. But when you entered *BRCvr – 2021 Art-Crawler Ride*, you were able to perform an automated movement allowing for a programmed visit of the space with the works of art. There were sculptures and installations among them, including interactive ones, labyrinths and domes which were used for presentations during the festival. Created characters, e.g. some animated mannequins and statues, were also displayed.

The transfer of the festival to a virtual environment added an interesting alternative. It is worth deliberating whether this change is temporary or it is like a *signum temporis*, which means the festival will not come back to the physical world. Additional aspects are related to this, e.g. the manifestation of physical corporeality, where the body is treated like a medium of sensual experience, which contributes to the creation of creative elements. Some behaviours created for the festival or rites that bring groups of people together, and/or the journey to the desert in Nevada, awaiting and meeting friends *face to face*, or odours coming from the burning of some works – that is the entire atmosphere established by people and their activities taking place in physical space. When the festival is transferred to the Web, these forms of expression will disappear. Their substitution was partially possible due to the use of the potential of the virtual world, i.e. replacing physical space with virtual space will lead to the creation of new conditions and challenges for artists and viewers. At the same time, the festival will be open to a wider audience, because of easier access to it and making use of and promoting its artistic ambiance:

"Recognizing that we are living in a postmedia age is not a point of arrival, but a point of departure. It means recognizing that the digital revolution

completely changed the conditions for the production and circulation of art, and that it is slowly but inevitably changing the ways in which art is experienced, discussed and owned."[14]

It is also worth paying attention to the interdisciplinary nature of the project where creators of various domains of art, including 3D designers and IT specialists, meet. The festival not only disappeared in the physical world, but it additionally used all its resources to achieve its objectives in the virtual world. Someone may claim with nostalgia that participants' emotions were previously special, or even exceptional, and their loss means rejecting a valuable experience. However, you may respond to that with the development of VR technology. Owing to its mediation with the Web, man has gained new experience, absorbing a redefinition of their corporality and the surrounding world. Thus, new conditions which are specific for the Web and related with man arose, but when users initiate relationships with other people, they need to take into account e.g. the possibility of those people logging out and the fact that they may also do it themselves in a second, losing a given contact irrevocably. Participation in such a festival may involve the continuation of the so-called ten *Principles*,[15] like Radical Inclusion, Radical Self-expression, or Communal Effort, which will need to change their forms, though they still may be treated as the imponderabilia of this festival. Specifically, the most interesting three principles are: Leaving No Trace, Participation and Immediacy. They will change in a more significant manner because they will be expressed through mediation whose effects will be known when this form of experience becomes more widespread.

> "Our ultimate goal in this research is to determine whether a VR environment can be reliably used as a viable substitution for real world experience, to the level of producing comparable biographic memories via the virtual emotional stimuli. In other words, can virtually induced emotional memory form similar neurological bindings as occur in real life? If we can prove this does happen, the implications for VR in the areas of education, training, entertainment, healing and personal growth may be profound."[16]

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[14] Domenico Quaranta, *Beyond New Media Art* (Link Editions, Brescia 2013), 202.
[15] The website where you can find *The 10 Principles of Burning Man*: https://burningman.org/about/10-principles/ (accessed: 23.09.2022).
[16] Jacquelyn Ford Morie, Josh Williams, Aimee Dozois, Donat-Pierre Luigi, "The Fidelity of 'Feel': Emotional Affordance in Virtual Environments", (ResearchGate, July 2005): https://www.researchgate.net/publication/235016125_The_Fidelity_of_%27Feel%27_Emotional_Affordance_in_Virtual_Environments (accessed: 23.09.2022).

Leaving elements of artistic installations in Altspacevr after closing of the festival may gain historical value by giving a testimony throughout the entire next year.

Another hub which attracted my interest was *The Void Gallery Hub* (by Wayland). Having entered it, visitors were surrounded by black and white 2.5 m high paintings which, to a certain extent, resembled prints inspired by representations of mandalas and colour-inverted katagami. The entire project was put in a black space, which increased contrast. Some of the paintings had teleports to other parts of the gallery. For example, the *Eyeball Zone* was a closed space with graphic motifs resembling paintings from the hub, but the entire work was maintained in bright tones and only with black elements. The viewer was surrounded by dominating representations of eyes which could be associated with intrusive voyeurism. Another place in this hub was *The Gallery Ruin* where the viewer was suspended in the space of a starry sky with blue and red clouds which surrounded objects resembling meteors that looked as if they had entered this space and destroyed something resembling an architectural object, e.g. a temple with a blazing fire, or a shattered garden with a tree and a colonnade alluding to Parthenon. There was another portal at the top of the gallery, leading to the multicolour *Psychadelia Gallery* where pictures alluding to its name were hung. You could also find a small camera there which invoked associations with the *Eyeball Zone*. This hub also contained more artistic places which were inspired by the themes of disability, death, and history of painting.

Each of the abovementioned galleries aroused interest owing to the manner of navigation which, to certain extent, could be associated with a labyrinth and travelling. The viewer could change the perspective and make decisions where to go. *The Void Gallery* shows that such a multi-part VR artwork may have linked artistic motives which, owing to developed VR technology, could ensure the continuity and coherence of the narrative. However, the diversity of forms and techniques used allowed them to subvert the recurring content. Using sculpture, colour, architectural objects and symbol, as well as text, and associating them with interactivity, animation and/or music, adds to effects in the virtual world which is co-created by artists.

VR ART – Dispersion and Condensation

I claim that VR ART may develop a new concept of the essence of art nowadays, in a manner similar to e.g. ready-mades, suprematism, conceptualism, or interactive art, and, in the 1990s, NetArt, or later bioart.[17]

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[17] This historical remark refers to artistic trends and/or specific creators who, at a certain moment in the history of art, in their artistic activities, developed the concept of the nature of the arts. What I have in mind is concentration on the manner of thought and creation,

"The contemporary work of art does not position itself as the termination point of the "creative process" (a "finished product" to be contemplated) but as a site of navigation, a portal, a generator of activities."[18]

With reference to the previously suggested definition of VR art, I suggest that we use the concept of an *artistic environment* considering a given created space in its entirety and fully adhering to virtual reality. VR ART means staying in and experiencing an artistically created world. Furthermore, VR ART combines and transforms our understanding of other types of art to a great extent, using visual arts, stage design elements and choreography, often including interactivity and artificial intelligence. This is achieved in the process of harmonious unification of those elements to create a new dimension in the entire VR environment. Thus, VR ART has enriched the form which is an outcome of this unification and does not accept the division between the artistic and non-artistic, because the form itself is frequently part of the virtual world. What I claim to be most important is that VR ART unites different trends and types of art, and does not try to disperse them. It is art which relies on the unification of various artistic trends.

The ontological difference between the physical and the virtual world, which constitute a different form of matter (physical vs. electronic), determines the nature of these two types of reality. It makes it possible for different beings to be created in those worlds, but virtual beings are not limited by the same physical boundaries as physical beings. VR ART, referring only to virtual reality, is subordinated to such Web mechanisms as virtual ownership, unlimited creation opportunities and realisation of various expectations, which will probably influence the forms of human needs in an unprecedented way. What is even more important, VR ART has suitable potential for carrying it out, which comes from technology that continues to develop. Therefore, the creation of virtual worlds will also increase and gain importance. This form of art broadens human needs adding to the dynamic development of art and virtual reality. They may serve to make further conclusions that VR ART is an example of the emergence of new structures. I understand virtual reality as a form which is becoming more and more of an alternative to physical reality and is independent when it comes to the growing need for its existence. VR ART is an example, or even a declaration that it is possible to unite and transfer a variety of phenomena to a new sphere of human experience and being – artistically created virtual reality.

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whose outcome is not a given artwork but, which is more important, the shaping of the development of art and making given artistic activities at a given time influence other forms of art in the future.

18 Nicolas Bourriaud, *Postproduction. Culture as Screenplay: How Art Reprograms the World* (Lukas & Sternberg, New York 2002), 13.

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SZTUKA VR
(streszczenie)

Rzeczywistość wirtualna rozwinęła się w ostatnich latach niewspółmiernie w stosunku do lat wcześniejszych. Światy wirtualne zyskały na znaczeniu, jak również wzrosło przekonanie o ich filozoficznym charakterze w połączeniu z dostrzeżeniem ich potencjału dla twórczości artystycznej. Rzeczywistość wirtualna w spełnia podobne funkcje, jak rzeczywistość świata fizycznego i może być dowolnie kreowana. Artyści i artystki od lat zwracali uwagę na VR jako medium możliwe do wykorzystania w procesie twórczym lub jako przestrzeń wystawienniczą. Mówimy o kilku wymiarach sztuki rzeczywistości wirtualnej wyróżniając po pierwsze prace istniejące w przestrzeni fizycznej lub hybrydowe, w których interpretuje się i rozwija znaczenie VR jako fenomenu oraz po drugie prace VR w dosłownym i zasadniczym rozumieniu, czyli projekty artystyczne od początku tworzone z przeznaczeniem dla rzeczywistości wirtualnej, będącej jedyną przestrzenią dla ich zaistnienia, wśród których z kolei można wskazać pojedyncze, autorskie realizacje lub powiązane strukturalnie projekty nawiązujące do idei Metaverse. Celem artykułu jest przeanalizowanie wybranych przykładów sztuki VR wraz z elementami ontologii tej rzeczywistości, do której sztuka przenika i w której powstają prace, jakie nie miałyby możliwości zaistnieć w świecie fizycznym.

Słowa kluczowe: sztuka nowych mediów, rzeczywistość wirtualna, NetArt, Post-internet Art, wirtualna galeria

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In 2007, he founded the Academia Electronica (www.academia-electronica.net) – a virtual, non-institutionalized part of the Jagiellonian University, acting on the model of university in the electronic environment in Second Life and AltspaceVR, where official academic courses and conference presentations are carried out.