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CONTRIBUTIONS GENERATED IN COLLECTIVE VIRTUAL INTELLIGENCE SPACES AND THEIR IMPACT ON SOUND DESIGN IN VIDEO GAMES
The Fandom Community of the Video Game *No Man's Sky*

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ABSTRACT

This research focuses on the study of the virtual community of fans of the procedural video game No Man's Sky and how the contributions of the wiki fandom are projected in the official updates published until February 2024.

Using a scientific methodology based on the content analysis of user interactions, we propose an exploratory study consisting of a virtual ethnography that identifies the audio content generated that has led to changes in the production of the updates of the video game analysed, thus establishing an effective correlation with the technological evolution of the title in question.

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1. Introduction

In the current social context, the mass media communication model is considered obsolete in the face of the rise of social networks and digital content platforms on the internet, which are conceived as dynamic spaces of social interaction where different audiovisual content consumption habits merge in an active, creative and collaborative way (Jenkins et al., 2015). These spaces of digital interaction position an infinite amount of content on the internet, consumed by users of so-called fandom communities, who find personal identification through digital products such as video game productions (Vizcaíno-Verdú, 2021). In this context, we can affirm that video games are fictional ecosystems that can be expanded and modified through the media (Paredes, 2022). Consequently, the firm purpose of the present research is to study the audio interactions posted in the largest fandom community of registered users of the video game *No Man's Sky* (Hello Games Ltd., 2024) and to determine the existing links with the official updates of the video game under analysis. From this framework, we deduce the existence of manifest links between fan communities or fandom communities in the design and development of video games through the published interactions of users, and how these are projected into the design and production of video games in the field of sound. Accordingly, the following specific aims are formulated:

1. To identify and classify the existing contributions on sound published in the specialised portal fandom.com, specifically in the wiki of the video game *No Man's Sky*, generated by the community of registered users in English language.
2. To analyse the official updates published for the video game *No Man's Sky* since its release and to identify the specific audio developments for the PlayStation platform (Sony Interactive Entertainment Europe Limited, 2024).
3. To establish the correlation between the content published in the video game fandom community and the official updates for the *No Man's Sky* video game.

The present study is conceived from an innovative perspective, as no relevant research has been found on the relationship between the content generated in digital fandom communities and their impact on the design and evolution of video game communities and their impact on the design and evolution of video game productions in the field of sound.

1.1. Characterisation of the Video Game No Man's Sky

No Man's Sky is an adventure and exploration video game that falls into the sandbox genre. A sandbox is a genre of video game in which the limitations imposed on the player are minimal in nature, allowing the player to roam and alter a virtual world at will. In contrast to a progression or linear style game, a sandbox game emphasises roaming and allows the player to select tasks. In contrast to games with segmented zones or numbered levels, sandbox games typically take place in a game ecosystem to which the player has full access from start to finish. These games are also known as non-linear or free-roaming video games. With a first-person gameplay, they immerse the player in a future time, immersed in an imaginary universe, composed of potentially infinite galaxies and planets. From the perspective of procedural content generation, each game allows players to experience unique sensations during exploration, trade, or combat on each planet of the innumerable galaxies in the game. The main objective is to reach the central core of the galaxy by exploring each of the planets along the way for items and small achievements that will supply the player with fuel, weapons, items, and money. There is a secondary objective, which is to try to reach an Atlas of alien origin. In order to interact with the Atlas, which is located in the final stages of the game, players must learn a fictitious alien language. This is necessary in order to communicate with the Atlas, which is a significant aspect of the game.

The game fully exploits the concept of survival, questing and exploration of planets through the presence of evocative scenarios full of exotic nature that manage to convey an extreme visual beauty. The primary quality of *No Man's Sky* is its ability to captivate the player through a compelling, alluring, and ephemeral visual and auditory presentation. The game's unique procedural generation allows players to be the first to discover and explore locations within the vast galaxy. This innovative approach is exemplified by the scarcity of secondary tasks such as trading and combat, which are often repetitive and inconsequential. However, they are simplistic and pertinent to the game's primary objective.

No Man's Sky is a non-linear video game that gives the player a sense of free will and freedom, which is difficult to find in other titles of the same genre released to date. This sensation is further intensified by the perception of polarised solitude under the prism of the first-person perspective gameplay.

1.2. No Man's Sky Sound Proposal

In the context of the extensive visual content proposal and the visual richness of the galaxy, the sound section of *No Man's Sky* stands out with particular brilliance due to the innovative solutions adopted to create a unique soundtrack for each player. The sound section is regarded as one of the most significant aspects of the game, which is the subject of this research.

In contrast to the conventional techniques employed in the production of sound for video games, which involve the generation of dialogue, music and effects in accordance with specific events and actions executed within the game, in *No Man's Sky* all audio is generated through procedural programming and emitted in real time from the game code itself, contingent on specific input variables. The values of these parameters are determined by physical environmental quantities presented in the game, such as the terrain of the environment, temperature, pressure, or humidity. The environment itself and its characteristics shape and model the sound events generated by synthesis techniques, thereby revealing itself as the protagonist of the sound design that is ephemerally established during the game experience.

> In contrast to conventional video games, which trigger sound events in accordance with the situation or area of the map, the procedural audio of *No Man's Sky* is generated from a multitude of environmental factors and events. These include the conditions of the planet being explored, its temperature, atmospheric phenomena, geographical situations, fauna and flora, situations of danger or a new discovery, flying through an asteroid field or facing enemies or hostile creatures. (Voinyx, 2016)

A clear illustration of this phenomenon can be observed in the sound of the wind, which varies in intensity and frequency in accordance with the characteristics of the terrain and its composition. As significant as the reverberation time is to the original sound sample, it adjusts its behaviour in real time in response to the size and proportions of the obstacles encountered. Consequently, the sound of the wind will differ depending on the location of the player. For instance, if the player is situated in a sandy area in an open field, the sound of the wind will be distinct from that of a mountainous area comprising rocky terrain, which is sheltered from the wind.

> The procedural sound synthesis technique offers considerable flexibility and a high degree of auditory realism, in accordance with the characteristics of the human auditory system, which is capable of identifying subtle oscillations or changes in the frequency composition of perceived sounds. All of these factors, in addition to numerous others, result in the generation of entirely unique and distinctive musical moments and environmental textures. Moreover, the sounds of the fauna that populate the different planets are also generated procedurally. Each animal species that is discovered will have its own unique and genuine howls or growls. (Voinyx, 2016)

The video game features a vast array of animal species, with the sounds emitted by the fauna generated through procedural programming. These sounds are heterogeneous and unique, varying according to each species. The sounds produced by the various animals present on each planet will be distinctive and unique, thereby differentiating each animal from any other location.

A plug-in software tool developed for the game allows users to modify fundamental parameters of the voice synthesis, such as the fundamental frequency emitted and the harmonic content present in the sound generated by the animal in question. The tonality of the sound produced is transformed to simulate an organic origin according to the physical characteristics of the animal, taking into account its physical complexion:

> Created a piece of software to electronically mimic a vocal tract as closely as possible and used the principle of “formants” to recreate the way a voice resonates within narrow bands of frequencies

> for each vowel. Many variables from within the game such as size, creature type, head:body ratio, impact on how these voices are generated. (Jones, 2016)

The synthesis of the representative voices of each of the *No Man's Sky* wildlife species will be modulated by measures of physical build, including head size, neck length, and behaviour.

1.2. Procedural Sound Design in No Man's Sky

The technical production of the videogame by *Hello Games* is notable for its exceptional sound design. As previously stated, the sound expression generated through the generation of procedural content reaches unknown limits until the launch of the videogame.

The quantity of sound events generated procedurally and their inherent randomness, inherent to the production system, can lead to the suspicion that the sound content is not acoustically coherent with the visual events that appear in the game. The verisimilitude of the acoustic and visual representations is a crucial element in the communication established during gameplay, which serves to enhance the sense of immersion in the game. The quantity and randomness of data generated in real time through procedural programming is considerable. However, this fact may give rise to doubts as to whether all this sonic exuberance of voices, effects, noises, music and silences will be comprehensible and not result in a kind of anarchy or sonic chaos. In his speech at the Sónar 2016 Festival of Music, Creativity and New Technological Trends, Paul Weir (Advanced Music SL, 2024) identified the significant challenge of integrating the procedural programming method into the soundtrack in order to ensure the game's coherence and harmony at all times. Weir asserts that the system he designed is compatible with the variable visual content created in the video game, establishing an almost symbiotic relationship with the audiovisual content.

> The most challenging aspect of the process is ensuring that the generated music and sounds align with the scene being depicted in the game. In the case of a dramatic scene, it is advisable to create an atmosphere that is similarly dramatic. In the case of a comedic scene, the atmosphere should be similarly comedic. The challenge lies in capturing the essence of the game and automatically adjusting the systems to reflect this. (López, 2016)

To achieve content integration and to avoid temporal inconsistencies or simply anarchy of sound events, *No Man's Sky* was implemented with audio middleware software tools. Weir opted for the *Wwise* software from *Audiokinetic Inc*. as the principal tool. However, in order to provide the video game with a greater complexity and richness of sound, it was necessary to develop two specific software tools capable of managing the procedural data flow. These tools, which were entirely designed by the technical team at *Hello Games*, comprise two plugins for *Wwise*: *VocAlien* and *Pulse*. The initial solution was designed to generate the sounds of the game's animal fauna, as previously discussed. *VocAlien* is essentially a sound production plugin that employs real-time synthesis. In contrast to the conventional approach of recording audio samples for subsequent processing, the system generates the sound through an oscillator, which is then processed according to the specific physical variables of the creature in question. This methodology allows for the generation of unique sounds for each animal species encountered during the course of the game.

> I've been working with Sandy White to build a physically modelled vocal tract that we call VocAlien to create entirely synthesised creature sounds. We planned to try this from the get-go as it was clear that creating sounds for the creatures was going to be problematic. Recording animals is difficult, time consuming and expensive, so there was a strong justification for investing in a modelled approach. VocAlien is a plug-in that sits within Wwise and can also be performed via MIDI it feels very much like an instrument. In a procedural game with procedural creatures, it makes sense to give them a procedural voice. (Broomhall, 2015)

From Paul Weir's statements in the interview with audio journalist John Broomhall, it can be concluded that the method of audio production carried out using physical modelling synthesis, in which the use of the MIDI protocol has played a key role as a system controller, was employed. *Midi Designer Pro*, installed on an *iPad*, was employed as a controller tool integrated within the Wwise system. This was used to create presets with which to generate the audio through procedural programming. The

outcome is a distinctive and novel combination of voices for each creature, without any adverse effect on the game's memory requirements.

With regard to the *Pulse* software, which was previously mentioned, it is responsible for managing the music section of the aforementioned procedural production. As it could not be otherwise conceived, this is developed below.

2. Methodology

A scientific ethnographic research methodology is employed in an exploratory study, which applies a content analysis of the audio interactions of registered users in the fandom community of the video game *No Man's Sky*, hosted on the specialised web portal fandom.com. Firstly, the observation of the registered user is conducted in order to ascertain the actions performed by the subjects within the virtual context of the fan community. In a subsequent phase of the research, an interaction analysis technique was employed to gather data within the virtual fan community. Similarly, a meticulous documentary analysis of the official updates published for the video game *No Man's Sky* was conducted in order to identify the audio implementations made and thus complete the methodology designed.

Once the object of study and method have been contextualised, as well as the questions raised through them, the following hypothesis is formulated: there is a positive correlation between the interactions of users in a fandom community and their projection in the design of the proposed video game updates.

The research yielded a considerable amount of data, which was found to be of a highly dispersed nature in terms of both complexity and extent. Consequently, a temporal scope of the study is established from the launch date of the video game *No Man's Sky* (August 2016) to January 2024, in order for the review to contain as many updates as possible.

3. Fieldwork and Data Analysis

In the initial phase of the research, the official updates to the video game were identified, and an exhaustive content analysis was conducted on each of them. This analysis aimed to identify the audio implementations made by the sound designers and programmers of the video game. Both gameplay enhancements and bug fixes in the programming were considered during the analysis of the data collected. As previously stated in the methodology section, the updates produced from the video game's official launch in August 2016 until January 2024 were considered. It should be noted that the developments made for the Playstation platform of the manufacturer Sony Computer Entertainment have been considered, as the video game was originally conceived and designed for this medium (Alonso Guisande, 2017).

In the second phase, the content analysis of the interactions of registered users in the *No Man's Sky* Wiki video game community was conducted and published on the English version of the specialised portal fandom.com, as it is the largest and is considered to have the greatest global projection. The following statistical data pertains to the fandom community as of 6 March 2024:

Table 1. *No Man's Sky* Fandom Community Statistics

Content websites	Total web pages	Archives
79.930	519.363	378.628

Source: Own elaboration, 2024.

The total number of users or list of members is 34,158,999. However, in the first instance, they have been filtered, with only those who have carried out at least one interaction in the virtual community in the last thirty days considered as active users. This was done by taking 14 February 2024 as the date of consultation, thus obtaining the figure of 108 active registered users.

4. Results

The results of the fieldwork are presented in Table 2 below, in comparison with the official versions. Firstly, the appropriate actions were carried out to identify the official published versions of the video game *No Man's Sky* for Playstation (Sony Interactive Entertainment, 2024). As can be seen, a total of twenty-four official versions and more than two hundred updates have been released since the launch date of the video game in August 2016 until January 2024. These were analysed to detect audio evolutions. It should be noted that the data identified as minor audio corrections or bugs in the different versions of the video game were not included in the analysis samples, as they were not considered to be relevant audio developments for the purpose of the study.

Table 2. Official released versions of the *No Man's Sky* videogame

Version	Designation	Launch date	Sound optimisations
1.0	Release	8 August 2016	NO
1.10	Foundation	26 November 2016	YES
1.20	Pathfinder	8 March 2017	YES
1.30	Atlas Rises	11 August 2017	YES
1.50	NEXT	24 July 2018	YES
1.70	Abyss	29 October 2018	NO
1.75	Visions	22 November 2018	NO
2.00	Beyond	14 August 2019	YES
2.20	Synthesis	28 November 2019	NO
2.30	Living Ship	19 February 2020	NO
2.40	Exo Mech	7 April 2020	NO
2.50	Crossplay	11 June 2020	NO
2.60	Desolation	17 July 2020	NO
3.00	Origins	23 September 2020	NO
3.10	New Generation	12 November 2020	YES
3.20	Companions	17 February 2021	NO
3.30	Expeditions	31 March 2021	NO
3.50	Prisms	2 June 2021	NO
3.60	Frontiers	1 September 2021	NO
3.80	Sentinel	16 February 2022	NO
3.85	Outlaws	13 April 2022	NO
3.94	Endurance	20 July 2022	NO
4.00	Waypoint	7 October 2022	NO
4.10	Fractal	22 February 2023	NO
4.20	Interceptor	5 April 2023	NO
4.30	Singularity	7 June 2023	NO
4.40	Echoes	24 August 2023	YES
4.50	Omega	14 February 2024	YES

Source: own elaboration, 2024.

As a pertinent additional piece of data to Table 2, we can indicate that as of 28 February 2024, the update is number 4.52, corresponding to the version called Omega 4.50, which has been subjected to analysis in this research, as referenced in the following paragraphs. Table 3 below presents the data

obtained from the study of the catalogued users of the *No Man's Sky Wiki community*. As previously stated, during the analysis phase, data from 108 active users were initially processed. However, no relevant data were obtained as the time scope designed was not covered. Consequently, the analysis criteria were established on the total sample of users of the English-language community, as shown in Table 3, which is 34,158,999:

Table 3. *No Man's Sky* Fandom Community Statistics

	Fandom Staff	Wiki Representatives	Wiki Specialists	Total Users
Users	302	39	41	**382**

Source: Own elaboration, 2024.

It can be demonstrated that the users corresponding to the categories shown in Table 3 are members classified as staff by the fandom.com website itself, based on the number and quality of their interactions as active members of the community. The quality of a contribution is evaluated based on the number of bytes generated since the publication of the content. Registered users are permitted to make modifications.

Table 4. Users, audio contributions and version of the video game

Users	Contributions	Date of last edition	Version
Alianin	3063	26 August 2019	Beyond
Therealmortaine	2607	29 January 2023	Waypoint
Pcj	377	26 August 2021	Visions
Game widow	323	15 June 2021	Echoes
SlyAceZeta	108	10 July 2022	Outlaws
CrsBenjamin	46	9 June 2020	Next
FANDOMbot	21	11 October 2023	Interceptor
TK-999	16	11 March 2023	Next, Abyss, Visions
Pikushi	13	13 September 2023	Prisms
Tagaziel	5	8 May 2023	Next
Surafbrov	5	13 May 2023	Endurance
Ferthi	4	10 April 2023	Interceptor
Itsjieyang	3	26 September 2022	Interceptor
Azxiana	1	21 July 2017	Pathfinder

Source: Own elaboration, 2024.

Table 4 presents a list of community users who have made significant contributions to the *No Man's Sky* audio-themed video game wiki at some point in the time span covered by the study. This includes contributions made at the temporal origin of the study, as well as subsequent edits made by other users. The volume of data, expressed in bytes, at a specific date on a published interaction allowed for the establishment of correlations with the official versions of the video game in force at that time.

The final section of the paper is written on the basis of all the data obtained during the fieldwork, which is shown in the tables in this section. It includes a discussion of the results obtained and the conclusions of the study carried out.

5. Discussion and Conclusions

This study postulates the existence of communicative links between the design and development of video games and the fan communities of these audiovisual products. These links manifest in the improvement of the design and production of the audio sections of these products. In the initial phase

of the research, the official versions of the video game *No Man's Sky* were identified as having significant implementations in the audio section, as evidenced by the data presented in Table 2 in Section Four of this paper. It can be concluded that the primary optimisations in the technical section of sound were implemented during the initial stages of the video game, between 2016 and 2020. Subsequently, between the years 2023 and 2024, in a more recent stage of the video game and with greater technological maturity, developments were implemented to address minor audio programming issues or computer bugs. This conclusion is consistent with previous research on video games, which has focused primarily on the design process and workflows in the production of triple-A video games with procedural content (Tait & Nelson, 2021).

The initial conclusion, derived from a comparison of the data with those obtained in the second phase of the study, which focused on the detection of proactive users of the fandom community, was that there was no evidence to suggest a temporal coincidence between the audio interactions of the community and the official versions of the video game. Consequently, the hypothesis formulated at the beginning of this research could not be validated, in accordance with the data found (Hedge & Grouling, 2021).

With regard to the first specific objective formulated, it is considered to have been achieved, as evidenced by the data in Table 4 in the Results section, which lists the sound-themed contributions by accredited users from the fandom community of the video game under analysis. The second specific objective is also considered to have been achieved through the detection and analysis of the official versions of the video game in question, following the verification of the implementations developed in the audio production. The pertinent data are presented in Table 2, which includes the official release date for the PlayStation platform and the audio optimisations carried out by the Hello Games videogame developer studio. Finally, the work carried out on the third specific objective has allowed us to infer that it was not possible to demonstrate the existence of links or relationships in the form of contributions from the *No Man's Sky* video game fandom community. This is because no decisive projection was identified in its official versions subsequent to the contribution of the community member.

The present study involved the processing of a substantial volume of data exhibiting considerable dispersion. Following the comparison of the competing databases, it will be proposed that future investigations continue this line of research in order to provide the scientific community with new relevant information in communication studies focused on the impact of content provided by users of new technologies.

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