DoongDoong.club: A Web-Based Metaverse Music Sequencer With Korean Onomatopoeic and Mimetic Words

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ABSTRACT

DoongDoong.club[1] introduces a unique musical metaverse, where participants collaboratively create real-time music with Korean onomatopoeic and mimetic words as a distinctive sound source. A line rotating clockwise on a vast disc-shaped space scans objects and generates individual sounds from each object. As a New Interface for Musical Expression (NIME), DoongDoong.club enables users of all musical levels to make music in real-time collaboratively, addressing entry barriers heightened by the rapid shift from in-person to online collaboration during the pandemic.

This study dissects elements of DoongDoong.club to show how they contribute to the musical metaverse. Y2K graphic style blends optimistic futurism with a touch of 2000s nostalgia. Emoji-based objects play Korean onomatopoeic and mimetic word recordings, enriching cultural and rhythmic nuances in compositions. Additionally, DoongDoong.club's Cul-de-Sac aligns with 2010's metafiction trends while showcasing its transition into the metaverse. This exploration emphasizes the platform's innovative contributions, featuring Korean onomatopoeic and mimetic words as a central, unique sound element.

Author Keywords

NIME, Musical Metaverse, Collaborative music-making, Network Ensemble, Onomatopoeia, Mimetic word, Telecommunication, Y2K, Sound Art, Web, Interactive Media

CCS Concepts

• **Applied computing** → **Sound and music computing;** *Media arts;* • **Social and professional topics** → Cultural characteristics;

1. INTRODUCTION

The COVID-19 pandemic has changed how people socially network and communicate almost exclusively online. It also impacted the field of music. Since musicians rely on sonic or visual cues, they require audio and visual sharing platforms. Musicians used platforms such as Zoom, Skype, and JackTrip [13]. While these tools might fit music professionals or musicians trying to rehearse traditionally, they did not necessarily reduce the barrier to entry for non-musicians to collaborate or function as a stand-alone musical instrument.

Meanwhile, several online collaborative music-making tools have been created since before the pandemic. Google Chrome Music Lab's Shared Piano [9], BeepBox [10], and GroovePizza [12] are the examples of them. These platforms invoke participants interested in making music by adopting the methods of games. However, their multiplayer collaboration strategies are different from the metaverse. They work not in real-time but rather like a relay; one following the work of the person before. "Musical Metaverse" is coined later, emphasizing real-time communication [15, 2].

By incorporating metaverse features, these platforms can include shared virtual spaces for users to interact, virtual concerts or events, and customizable avatars to represent participants. This infusion of metaverse elements aims to amplify the sense of social connectedness among music creators, fostering a shared and enjoyable experience within the collaborative process.

This led our team to explore making a New Interface for Musical Expression (NIME) that integrated social connectedness and enjoyment with a low barrier to entry for non-musicians. We suggest DoongDoong.club, first exhibited at the "Party in a Box!" exhibition held at Art Center Nabi, Republic of Korea, 2021, as one case.[2] DoongDoong.club works as a real-time multiplayer music sequencer as movements of players and objects make one piece of music [4].

This study explores the convergence of music, technology, and language culture to promote artistic creativity and experimental expression. As this is a web-based collaboration tool, it facilitates users to collaborate across multiple platforms. It aims to design how components of the metaverse, like avatars, locomotion, and object interaction, can enhance the immersive and engaging aspects of music creation for users. It aspires to overcome temporal and spatial restrictions that have emerged post-pandemic through innovative approaches in music interface design.

2. THE DESIGN OF DOONGDOONG.CLUB

DoongDoong.club is shown inside a CRT monitor-like screen constructed with a Perlin noise effect. On a giant pink disc, two-dimension drawn objects are placed with players. The giant green line, called *the scanner*, rotates the disc clockwise as the clock hand rotates. Whenever the object or the

[1] `doongdoong.club`

[2] `https://www.nabi.or.kr/en/page/board_view.php?brd_idx=1134&brd_id=project`

NIME'24, 4–6 September, Utrecht, The Netherlands.

Figure 1: Perspective View of DoongDoong.club.

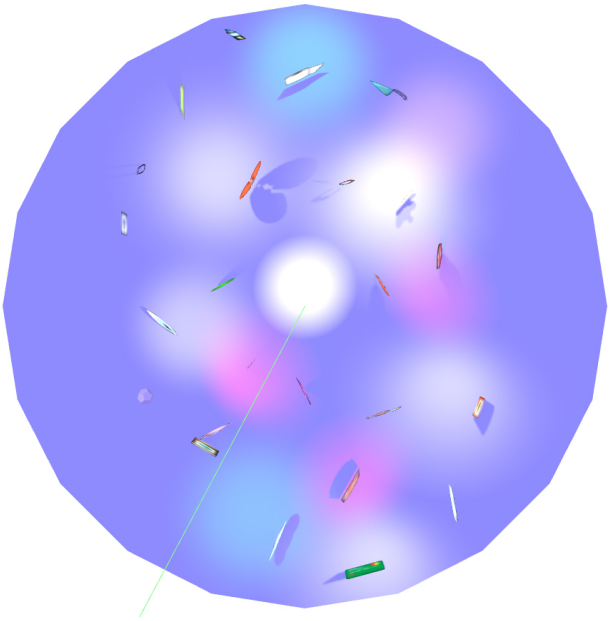

Figure 2: Top View of DoongDoong.club

player passes the scanner, it plays its sound. Each object plays a recorded Korean onomatopoeic and mimetic word, while the player makes a sine, triangle, sawtooth, or square waveform. Music is created by moving the player or pushing and placing the objects.

2.1 Motivation for Adopting the Y2K Graphic Style

"Y2K", originally a term for the computer bug that cannot indicate the new millennium, 2000, transitioned into the symbol of that era - from the late 1990s to the early 2000s as the internet has explosively expanded. With the hope of the new century, it features an optimistic future [17, 5]. This style accentuates characteristics commonly observed in early 2000s digital design, such as highly saturated color palettes, scan lines, gradients, realistic color loss, and distortion.

Y2K style became a trend again with the pandemic as a reminiscence of the good past and the hope of a vigorous future, in contrast with the dull reality [5]. The graphics of DoongDoong.club also embraced a graphic style of the Y2K era with a contemporary sense to alienate the space from the real world, especially during the COVID-19 pandemic.

Figure 3: Y2K Styled Play Screen

2.2 Using Korean Onomatopoeic and Mimetic Words in DoongDoong.club

The Korean language consists of a large amount of onomatopoeic and mimetic words. Among about 400,000 words in the Standard Korean Language Dictionary, more than 15000 words are inferred to be onomatopoeic and mimetic [14]. They also play an important role in the Korean linguistics. Onomatopoeic and mimetic words are native while about 70% of words in the Korean language are loanwords [3]. Onomatopoeic and mimetic words are thus important in the Korean language and culture.

Another noticeable characteristic Korean onomatopoeic and mimetic words have is their distinctive tonal and rhythmic qualities. Mimetic words, a sonification of the motion, inherit its movement as a rhythmical image. Because of these features, onomatopoeic and mimetic words are intuitively understood regardless of age [1].

What will people hear When these unique tones and rhythms are combined into a single song? Will people understand them as a harmony of the song, or hear each component individually? Imagine various individuals collaborating to create compositions with these sounds –what kind of song could be crafted? DoongDoong.club serves as a space for experiencing the creation of experimental music through such endeavors.

2.3 Emoji-Inspired Objects: Enhancing Cross-Linguistic Communication

Figure 4: Example of Emoji-Styled Objects

Emojis possess the characteristic of low language dependency, making them conceptually understandable across various language communities [7]. We mitigate potential regional limitations caused by Korean words with emoji-style graphic elements for users to match sounds with visuals and recall them. The objects, thus, facilitate a straightforward understanding of sounds in diverse languages, transcending regional constraints. Consequently, it promotes

effective communication between objects and users, offering functionality to overcome linguistic barriers. Table 1 refers to the exhaustive list of objects and their Korean onomatopoeic/mimetic words, meanings, and romanizations. We followed the romanization rule established by the National Institute of Korean Language [11].

2.4 Player Character

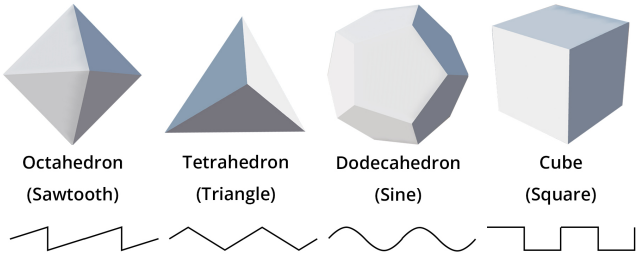

Figure 5: Mapping of Player Shape(Platonic Solids) - Oscillators

A non-humanoid platonic solid player character distinguishes itself from non-player objects to foster a sense of detachment from the real world. This fundamental three-dimensional shape simultaneously triggers nostalgia for early computer graphics while existing as a complete artifact. DoongDoong.club, where artificial objects like emojis and platonic solids float around, paradoxically becomes a space where everyone converges on an equal footing.

Basic waveforms, the representative of artificial sounds, are mapped to the player's shape. The square wave is mapped with a cube with all faces as squares, the triangle wave is linked to a tetrahedron with all faces as equilateral triangles maintaining a triangular shape when viewed from above. The sawtooth wave is mapped with an octahedron where all faces are equilateral triangles, but when viewed from above, it appears as a squared shape, inspired by its waveform rising like the triangle wave but descending like the square wave. The sine wave is linked to a regular dodecahedron, where the shape of each face most closely resembles a circle.

2.5 The Cul-de-Sac of The Metaverse: A Symbolic Inquiry

The starry universe appears at the end of the disc to show DoongDoong.club as one town of the internet world. The player may proceed to move and get out of the disc, but they will have a warning narration. If they ignore the warning and proceed, they will be transported to different places of the internet world as an Easter egg.

This also draws inspiration from the trend of meta-fiction games that emerged in the early 2010s. Players move beyond the confines of the virtual space but with a warning dialog. This cautionary message serves a similar purpose as the narrator in *The Stanley Parable*(2013) [6], advising players against venturing outside the prescribed boundaries of the game [8]. The design, however, encourages critical engagement with the system, enabling players to defy caution and explore beyond.

3. WEB DEVELOPMENT

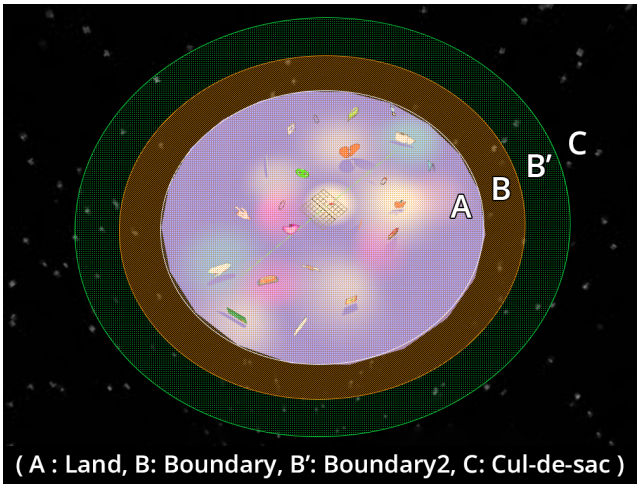

Figure 6: Spatial Layout Diagram of Doong-Doong.club.

We used PlayCanvas[3], a webGL-based game engine, for the implementation. It manages the keyboard movement, physics engine, UI, graphics, and onomatopoeic and mimetic word recording plays. Players' sound is implemented with Tone.js[4] for the real-time generation. Tone.js is an open-source javascript framework that works on top of Web Audio API to handle interactive audio on the web. The player's customization of waveform, pitch, and effects is rendered through Tone.js. For onomatopoeic and mimetic words for the non-player objects, 4 Korean people who speak Korean as a first language recorded them in their daily speech style.

We also used Node.js[5] and socket.io. Node.js is an open-source javascript framework for building a server. Socket.io[6] is a library that establishes the communication between the server and the client. The server is then deployed in Microsoft Azure Virtual Machine.[7] Using socket.io as a module inside Node.js, the server handshakes with the client.

Socket.io facilitates real-time synchronization between objects, player participation status, and player locations. Upon user connection confirmation, a socket corresponding to the user's ID was created and placed in the players' array. JSON formatted messages that contain player events (creation of self and others, player movement, object movement)

[3]https://playcanvas.com/
[4]https://tonejs.github.io/
[5]https://nodejs.org/en
[6]https://socket.io/
[7]https://azure.microsoft.com/en-us/products/virtual-machines

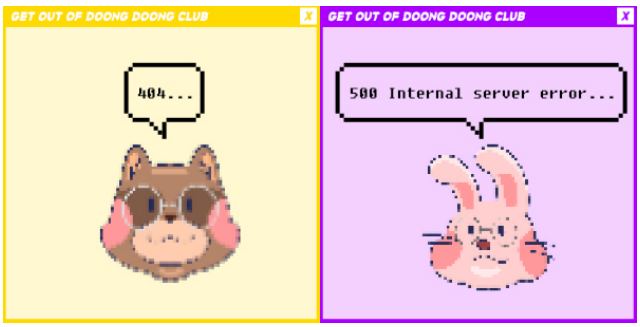

Figure 7: Y2K Styled Error Message Graphics before the escape.

Table 1: Onomatopoeic/mimetic words list

Object	Onomatopoeic/mimetic Word	Meaning	Romanization
a birthday hat	위후	an exclamation	wihu
a Worm-eaten apple	꿈틀	a worm moving	kkumteul
cake	슈르릅	lips smacking	syureureup
a paper clip	틱	a paper clip hitting somewhere	tik
a bottle of whipped cream	푸우우	whipped cream being sprayed	puuu
candy 1	츄릅	lips smacking	chyureup
candy 2	따다닥	candy cracking	ttadadak
a broken heart	카지직	heart cracking	kajijik
a tin can 1	뽁	a lid popping out	ppok
a tin can 2	스르륵	a mild grinding noise	seureureuk
a tin can 3	챙캉챙캉	cans hitting each other	chaengkangchaengkang
an error message 1	삐	a beep sound	ppi
an error message 2	에	a beep sound	e
a bell pepper	아삭	a bell pepper being biten	asak
an eyeball	데구르르	a ball shaped object rolling	degureureu
a button 1	꾸욱	soft materials being squashed	kkuuk
a button 2	달칵	a noise when button is pushed	dalkak
a love potion 1	뾰로로롱	a magical sound effect	ppyorororong
a love potion 2	삐용삐용	a magical sound effect	ppiyongppiyong
a toilet paper 1	풀럭풀럭	sheet wavering	pulleokpulleok
a toilet paper 2	둘둘둘	something coiled around	dulduldul
a credit card	띠로링	a payment jingle	ttiroring
an alien	왹	an alien talking	oek

were stored on the server and transmitted to the relevant clients, ensuring synchronization of object and player positions on each player's screen.

4. FUTURE WORK

The DoongDoong.club envisions several key directions for future work.

First, for accessibility, we will optimize its play experience by diversifying platforms such as the mobile environment. This aims to enhance usability and facilitate easy participation in the music and creative processes for a larger audience.

Second, we are planning for a new feature that replaces the sounds of existing objects through voice recording. Drawing inspiration from the unique game format of *JellyCar Worlds* (2022), where players record engine and collision sounds with their voices to navigate cars through various stages, voice-based customization offers new possibilities for users to create personalized music experiences [16]. This functionality is expected to archive onomatopoeic expressions in various languages, enabling users to associate different languages with the same emoji.

Third, we plan to enhance the platform by adding a replication feature for sound objects, enabling users to create more innovative and diverse musical effects through interaction. Currently, each object is fixed to a single instance, but allowing users to replicate objects could boost creative music production as users manipulate and explore sounds within the metaverse.

Last, DoongDoong.club aims to extend its immersive experience by evolving into a three-dimensional sound installation. This will give users a sensory experience, allowing them to perceive the directionality and location of sounds in the installed environment.

5. CONCLUSION

DoongDoong.club presents realistic applicability in digital design and metaverse development. Adopting familiar game mechanics for navigation encourages user engagement, facilitating easier interaction and creative music generation within the metaverse. This user-friendly design provides a metaverse environment accessible to users of various ages and experience levels.

The attempt to create music using Korean onomatopoeic and mimetic words embraces cultural characteristics and explores new artistic expression methods. Consequently, DoongDoong.club showcases unique aspects of Korean culture, allowing Korean-speaking participants to enjoy musical experiences rooted in their familiar language and cultural background. Non-Korean speakers can also embrace new musical experiences rooted in the cultural background of Korea. Therefore, this research provides insights into future metaverses' design and cultural integration, anticipating practical usability across various fields.

6. ETHICAL STANDARDS

Sunwoo Song and Yejin Lee voluntarily contributed by drawing two-dimensional objects for DoongDoong.club and participated in recordings. This research received no external funding. The authors declare no potential conflicts of interest. No animals were involved in this research.

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