

EyeLa

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1 Program Notes

EyeLa is an accessible digital musical instrument (DMI) augmented reality (AR) app and rhythm game, designed for the musical engagement of children with multiple disabilities. It makes available head and eye movements as alternative input methods that are more intuitive and better aligned with natural body movements, empowering children with limited mobility to actively participate in music-making. *EyeLa* has also been made available as a rhythm game, lowering barriers to musical participation through game-based interaction that is accessible, motivating, and inclusive.

2 Project Description

Engagement in music-making is an enjoyable and rewarding learning experience that contributes to the intellectual, social, and personal development of children and young people [1]. However, conventional musical instruments often require precise fine motor control and dexterity, which can create barriers for individuals with functional diversity [2]. *EyeLa*, an accessible digital musical instrument (DMI), is designed to support the musical engagement of children and young people with multiple disabilities that prevent them from interacting with conventional musical instruments. It runs on commercially available virtual reality (VR) headsets with eye-tracking capability, enabling users to select and play musical notes by moving their eyes. This approach—playing music through natural body movements—allows these children and young people to create music independently and autonomously, thereby promoting a more equitable and inclusive learning environment [3].

The user interface of *EyeLa* incorporates hexagonal grids (Figure 1) [4], allowing users to navigate through musical notes trigger musical events using eye movement. Users can also switch to head-tracking mode without using eye movements, thereby adapting to the functional needs of each individual. The passthrough function enables users to see the real world while interacting with visual artefacts in the augmented environment, opening up possibilities for ensemble playing and collaborative music-making while lowering the anxiety of targeted users when engaging with an unfamiliar virtual environment. Other options—such as the choice of musical instruments, switching between eye- and head-tracking, (un)mute, and key changes—are available in the bottom row of the layout.

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Music Proceedings of the International Conference on New Interfaces for Musical Expression
NIME '26, June 23–26, 2026, London, UK

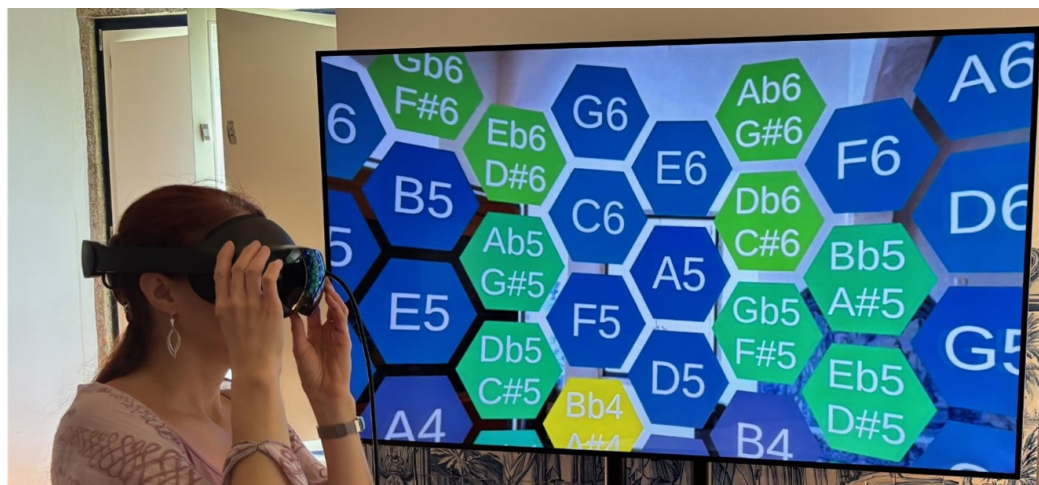


Fig. 1. User Interface of *EyeLa*.

The app was developed using Unity for the Meta Quest Pro, a commercial VR headset equipped with eye-tracking capability. Catering to individuals with functional diversity, the entire app can be controlled solely with eye movements, without the use of virtual hands or VR controllers.

3 User Experience

Once assisted in wearing the VR headset and launching the app, the note layout is presented to the user and can be interacted directly using eye movements. A semi-transparent line rendered between the eyes indicates the direction and position at which the user is looking. A hexagonal tile is highlighted if the rendered line collides with it, meaning a particular musical note is being targeted. An eye blink triggers the selected note to be sounded with a chosen instrument, provided a note is targeted. As a monophonic musical instrument, only one note can be triggered at a time; blinking on empty space will stop any sound.

After becoming familiar with *EyeLa*, the user can play simple melodies using eye movements, as if playing a musical instrument—but without using their hands. As an AR app, the user can also see others through the passthrough function in the VR headset. This allows for collaborative music-making with other musicians, including receiving cues from a conductor in an orchestra. For users without functional diversity, the experience offers insight into how their disabled counterparts can make music and be creative, thereby enhancing empathy and promoting inclusive practices in the arts.

4 Rhythm Game

A rhythm game was developed as a side quest of *EyeLa* to support self-directed practice and provide an accessible gaming experience for target users. Instead of clearing falling blocks at specific timings to score as in typical rhythm games, *EyeLa* uses ‘zoom-in’ hexagonal rings to indicate the position and timing of note triggers within the 360-degree virtual environment (Figure 2). At the current stage, popular classical repertoire pieces are available within the rhythm game, representing different levels of difficulty for users to challenge themselves. By engaging with the rhythm game, they can develop their rhythmic sense and relevant cognitive skills [5].

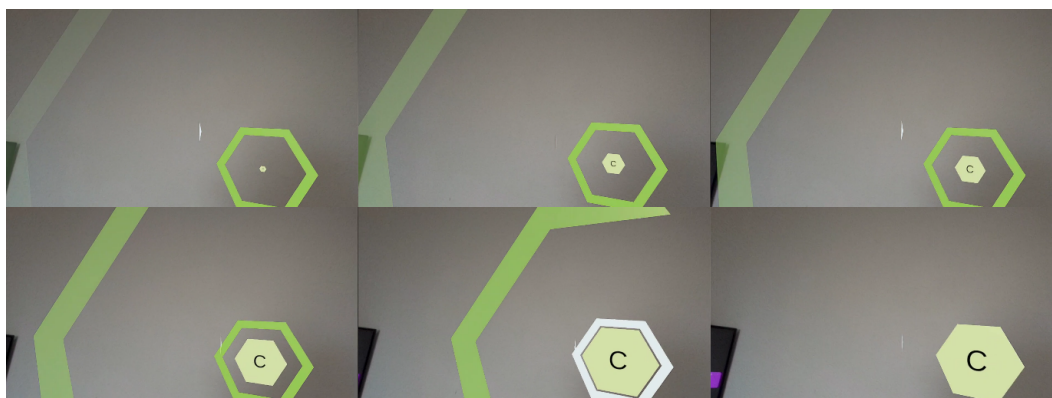


Fig. 2. Animated hexagonal tile in the rhythm game of *EyeLa*.

5 Future Work

EyeLa can serve as an authentic musical instrument for individuals with limited cognitive and sensorimotor functioning. Through regular practice, users can develop instrumental skills, empowering them to make music both autonomously and collaboratively as musicians. It challenges established ableist practices in conventional music-making environments, creating opportunities for musicians with disabilities. Future directions for *EyeLa* include developing additional functionalities to support musical creativity and incorporating gaming elements to enable accessible gameplay in immersive environments [6].

6 Technical Notes

The artist will provide:

- A VR headset with eye-tracking capability
- A computer capable of running apps on Meta Quest Pro VR headset

The following will be required from the venue/house:

- A TV (50" or larger, mounted on a wall or mobile stand) to display the in-headset view to the audience
- Power supply with an extension lead (at least three electric sockets)
- An area of approximately 2 × 2 meters with a chair

7 Media Link(s)

- Video demo: <https://www.youtube.com/shorts/47uqooMMg14>
- Project URL: <https://digitalgood.net/research/accessible-digital-musical-instruments-for-inclusive-and-social-practices/>

Acknowledgments

This work was supported by the ESRC Digital Good Network through the University of Sheffield (grant reference ES/X502352/1).

Ethical Standards

EyeLa was designed with adherence to NIME's ethical guidelines. No personal data are collected during the engagement with the work, and all interactions are non-invasive.

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