

# PIANOVISION - AN AUGMENTED REALITY PIANO PLATFORM

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## ABSTRACT

PianoVision presents the best version yet of an educational piano app for Oculus Quest. Not only does it overlay notes onto the real piano using passthrough and hand tracking, but it also responds to user's playing in real time through connections with MIDI-enabled keyboards.

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## 1 INTRODUCTION

According to Harry Baker, from UploadVR, PianoVision feels like the natural culmination of many previous piano apps on Oculus Quest. As new features become available to developers, each successive piano app has added more functionality and made large improvements in one or more areas. PianoVision might be the best version yet.

It essentially lets the user align a virtual piano to his/her real keyboard, and then uses passthrough to teach songs by displaying notes falling in sequence toward the keys, as shown in Figure 1. This functionality by itself isn't new — others have done it before<sup>1</sup> — but the real killer feature of PianoVision is the ability to connect the headset to a MIDI keyboard or piano. Once connected, the app is able to tell which notes you're hitting on the piano, responding to your playing in real time. If you miss a note or play the wrong one, the sequence stops advancing until you recognize your mistake and play it correctly.

This works through a connection with a desktop app for PC and Mac. The desktop app connects to your MIDI-enabled keyboard via USB, then communicates wirelessly with PianoVision on Quest in real time.

## 2 OBJECTIVE

PianoVision allows the user to play using two distinct modes: with a real piano and with a virtual one. The real piano option means that a MIDI piano can be either connected to the Quest by using a USB-C cable or indirectly by means of a Desktop App. The recognition of

<sup>1</sup><https://uploadvr.com/quest-piano-hand-tracking/>

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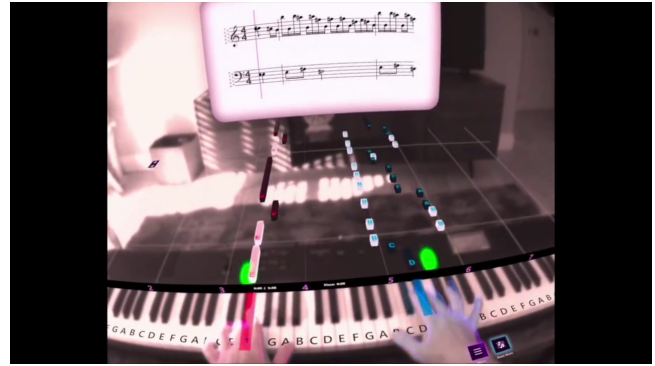


Figure 1: User playing a song using Quest 2 as an Augmented Reality display.



Figure 2: Two players interacting in PianoVision.

the keys is still a challenge in the virtual piano option, but it works flawlessly using the MIDI input provided.

Despite the fact PianoVision is available through App Lab, which means that the application is experimental or still under development, it already has 74 ratings, with 91% of them being 5 stars.

Some of PianoVision features are:

- Sheet Music Insight to learn sight-reading
- Multiplayer Concerts
- MIDI keyboard connectivity
- Air piano for those without physical pianos
- Upload custom songs using the Desktop App
- Multiplayer Music Instruction (as shown in Figure 2)
- PianoVision Music Hall in VR (as shown in Figure 3)
- Indicators to show you what fingers to play with for select songs
- Built in Courses



**Figure 3: Possibility of changing the virtual scenario. Audience is also possible in the virtual hall.**

### 3 MATERIALS AND METHODS

The application was developed for Oculus Quest using its Interaction SDK<sup>2</sup> and Unity<sup>3</sup>. Interaction SDK is a library of modular, composable components that allows developers to implement a range of robust, standardized interactions (including grab, poke, raycast, and more) for controllers and hands. Interaction SDK also includes tooling to help developers build their own hand poses.

Interaction SDK analyzes discrete hand poses and tracks the position of certain key points on users' hands, such as knuckles or fingertips, in real time as the hands are moving. When hands are used as input, the hand's pose drives a laser cursor-pointer that behaves like the standard controller cursor. It is possible to use the cursor-pointer to highlight, select, click, or write app-level event logic. Integrated hands can perform object interactions by using simple hand gestures such as point, pinch, unpinch, scroll, and palm pinch, as shown in Figure 4.

Since PianoVision was designed for bare hand interaction, for its demonstration a single Oculus Quest 2 is needed. We may also use a TV to stream in real time the user view to the general audience.

### 4 CONCLUSIONS

Even in Early Access, PianoVision is making huge strides for music education options on Quest. The next big missing link for this kind of technology is being able to provide tips on technique, both

<sup>2</sup><https://developer.oculus.com/documentation/unity/unity-isdk-interaction-sdk-overview/>

<sup>3</sup><https://unity.com/>



Pinch to Select.  
Pinch and Drag to Scroll



Look at your raised palm and pinch to return to System Menu

**Figure 4: Example of hand gestures supported by Oculus Interaction SDK.**

in a technical (finger and hand position, moving between notes fluidly, etc.) and expressive (dynamics, feel, emotion) sense. Given how complicated and subjective those are, that's probably still years off becoming a reality. But for now, PianoVision is one of the most interesting VR-based music learning software we've seen as it presents a fascinating glimpse at the potential benefits and avenues of using VR as an educational tool.

PianoVision is freely available at PianoVision Incorporated website<sup>4</sup>. Video demonstrations of the application together with the Desktop app can also be found there.

<sup>4</sup><https://www.pianovision.app/>