

# PianoAR

Project presentation

---

DESIGNED BY PianoAR Team In Technion Israel

# Meet Our Team

PianoAR

---



**Gal Shalom, Ariel Iny, Alex Bondar**  
Bachelor Computer Science Students, Technion ,Institute of Technology, Israel

# Goals

PianoAR

---

## Use an AR application to teach how to play piano

Using Unity as a platform for developing MR,  
and Microsoft HoloLens v1 as a AR device

### Primary Objectives

1. Easy to use
2. Accurate piano recognition
3. Lite weight key-press detection
4. Positive feedback for playing
5. Intuitive UI

# Features

PianoAR



Piano Keyboard Detection



Voice Command Interface



Key Press Detection



Multiple songs to learn



Interactive feedback

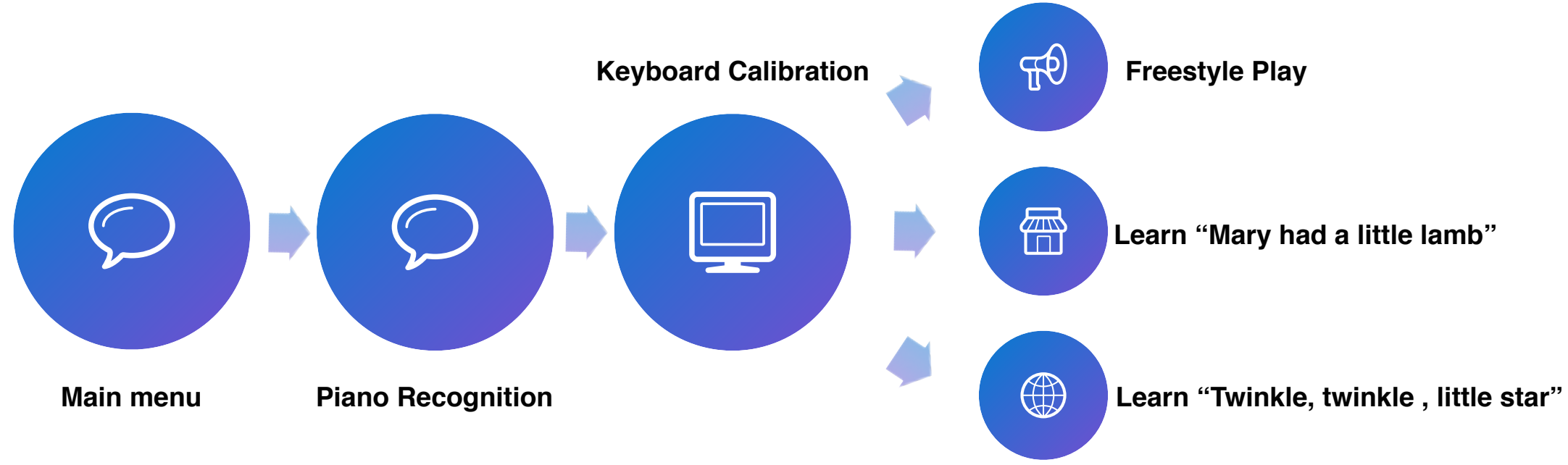


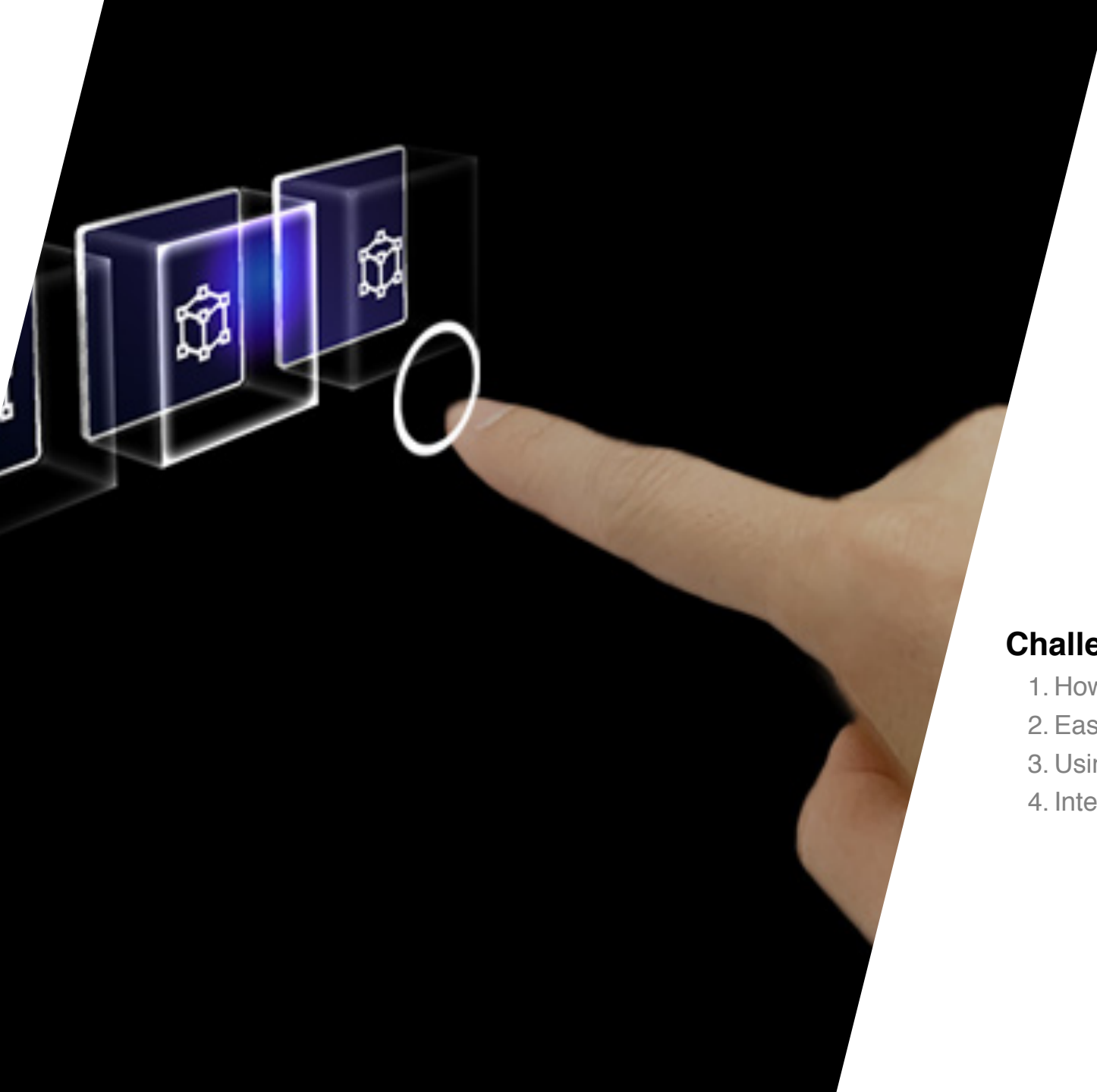
Useable on any piano



# Gameplay

PianoAR





# Main Menu

PianoAR

---

## Interactive Menu

The menu contains buttons to select the desired option. The menu will tag along the user and includes voice command interface.

## Challenges

1. How to do a tag along menu
2. Easy to use menu
3. Using the menu without head movement
4. Interact with buttons through hand gestures

# Piano Recognition

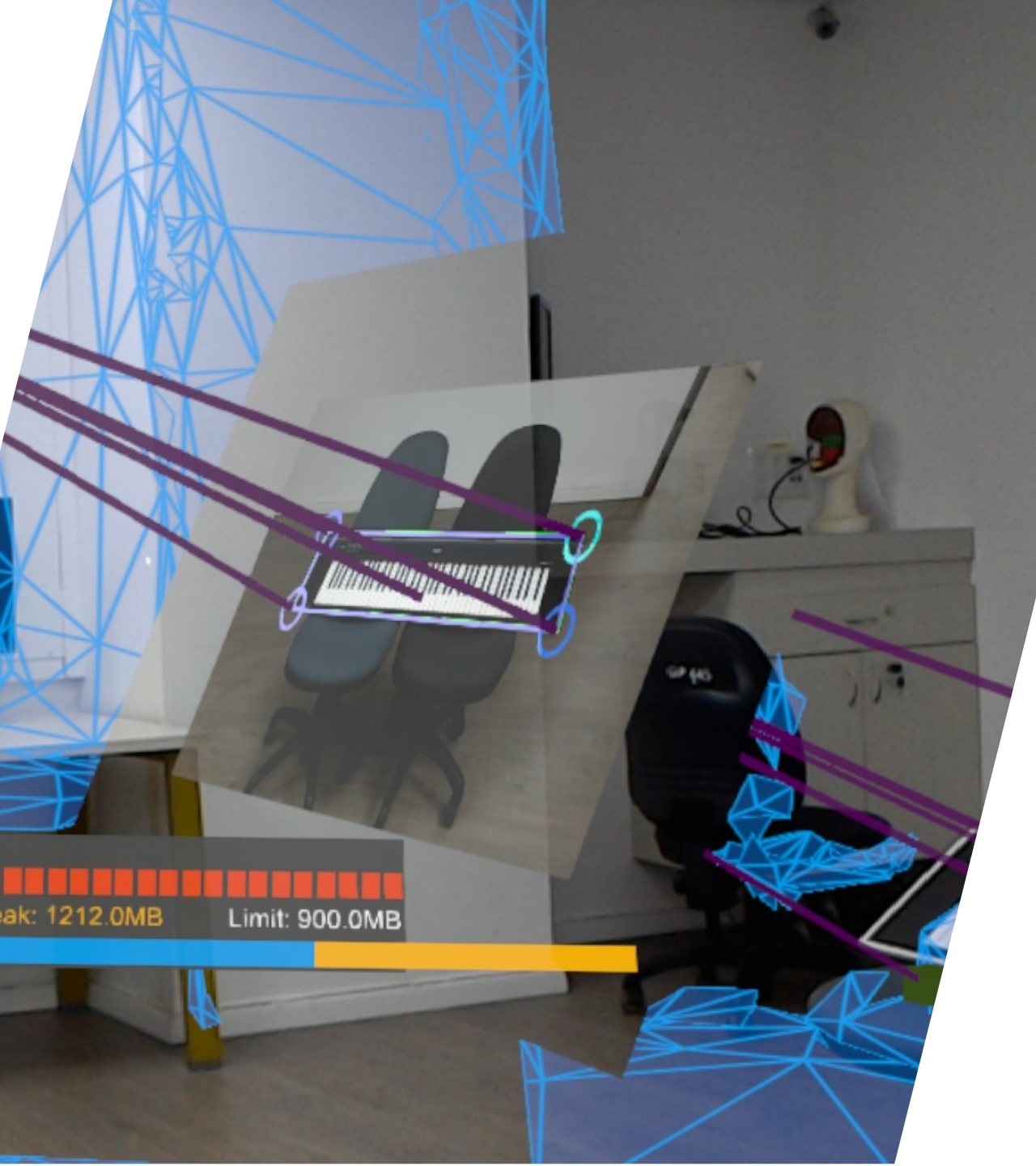
PianoAR

## Image Processing recognition

The recognition of the piano keyboard using OpenCV library, using linear operations of image processing. After that, Placing virtual piano model on top the real piano.

## Challenges

1. Learning image processing
2. Build Piano 3D model in Unity
3. Recognition of piano keyboard, without any assumptions on the piano
4. Transforming 2D coordinates to 3D coordinates
5. Light resource algorithm for piano recognition
6. Hololens weak processing power



# Keyboard Calibration

PianoAR

---

## Keys Calibration

Under the assumption, the user won't move this head. We calibrate the middle octave of the keyboard to be detected by the application when pressed by the user.

## Challenges

1. Learning image processing
2. Calibration and detection method while keeping it as simple as possible.
3. Few limitations as possible on the user
4. Hololens weak processing power

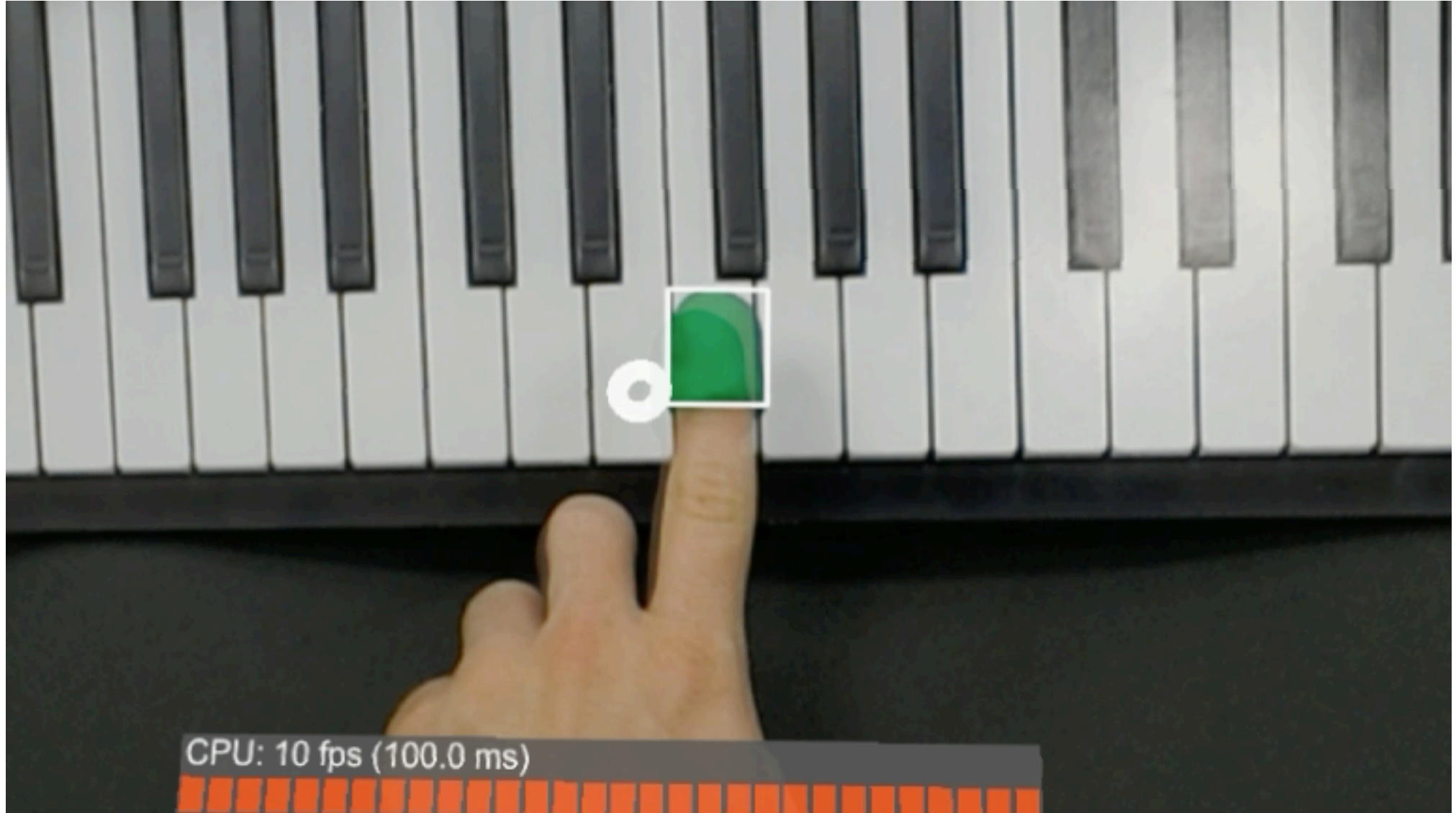


# Finger Recognition

## Demo

PianoAR

---





# Freestyle play

PianoAR

---

## Interactive playing

The application will color in yellow the key that is pressed by the user as a feedback.

## Challenges

1. Detection of the pressed key
2. Few limitations as possible on the user
3. Colouring the correct piano key
4. Hololens weak processing power



# Song learning

PianoAR

---

## Interactive learning

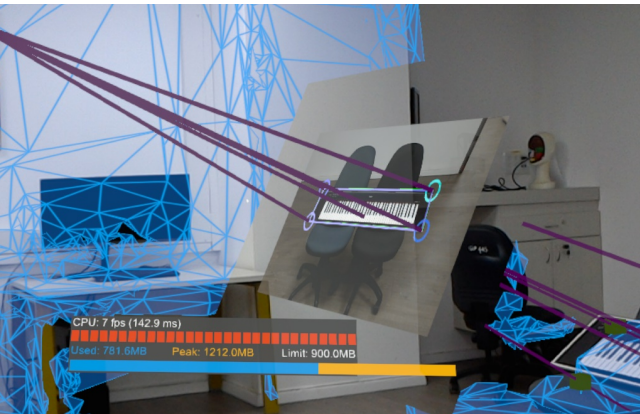
Under the assumption, the user won't move this head. We mark the current key to be pressed by the user, and give feedback according the user correctness. Green for correct pressing, Yellow for need to be pressed & Red for wrong key.

## Challenges

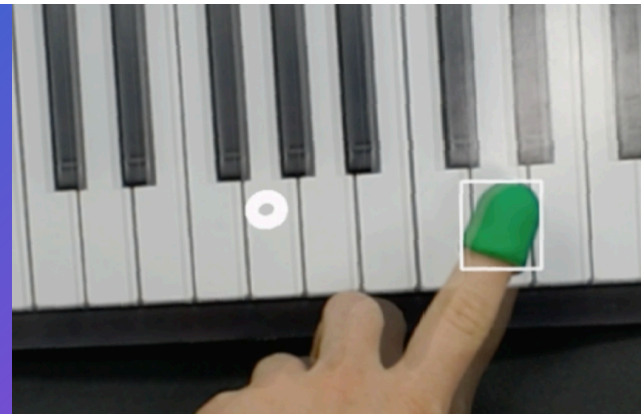
1. Detection of the pressed key
2. Few limitations as possible on the user
3. Colouring the correct piano key
4. Hololens weak processing power
5. Design an intuitive feedback
6. FSM for every song

# Development Process

PianoAR



3D Modeling



Keyboard Calibration

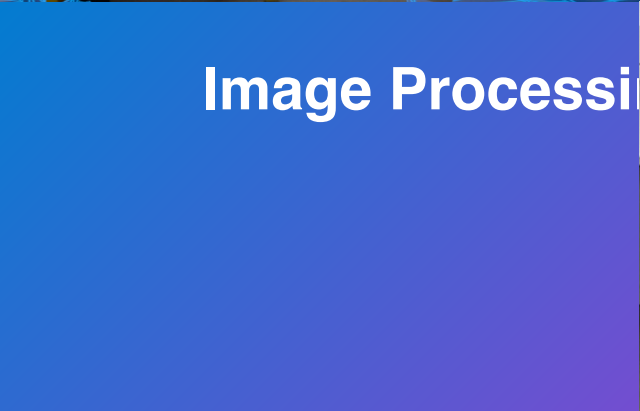
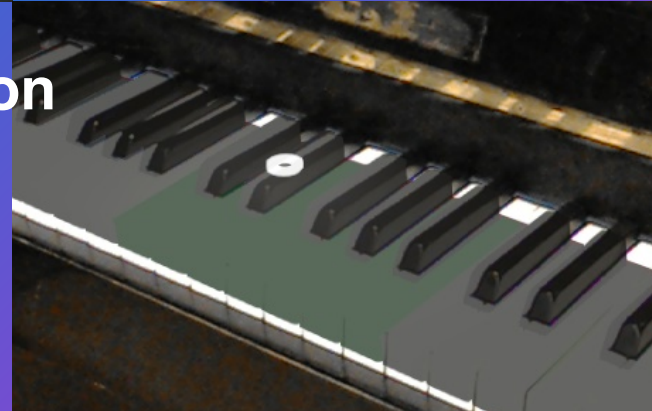


Image Processing



Finger Detection





# Demo

## PianoAR



# Comments & Questions

PianoAR