Task 13.1 Documentation

September 17, 2024

1 Introduction

This project aimed to develop an interactive Tic-Tac-Toe game where players can make moves by performing specific hand gestures. The game used a computer vision model, YOLO, to detect the ("X") and ("O") gestures. A 3x3 grid was displayed on the screen, and gestures were translated into moves within the grid.

2 Methodology

2.1 Hand Gesture Recognition

- *We implemented hand gesture recognition using Python game code and the YOLO model. which allowed for real-time video capture and gesture detection.*

2.2 Grid Layout implementation

- *A 3x3 Tic-Tac-Toe grid was implemented.*
- *Upon recognizing a gesture, the corresponding "X" or "O" was placed in the selected grid cell.*

2.3 Integration with YOLO and Gesture Detection

- *The Python code for both the hand gesture recognition and the game grid layout was integrated by linking gesture detections to game actions. When a gesture was detected by YOLO, the grid would be updated in real-time to reflect the move.*

3 Challenges

3.1 Fixing Code Bugs

- *During the development phase, we encountered several code bugs that affected the integration between the gesture recognition and the game logic and we have fixed it*

3.2 Compatibility with YOLO

- *Adapting our codebase to work with YOLO's output required significant modifications. We had to ensure that the bounding box coordinates generated by YOLO were correctly interpreted and mapped onto the Tic-Tac-Toe grid.*

3.3 Training a Larger, Better Model

- *Initially, the YOLO model struggled with recognizing gestures in varying conditions. We trained a larger model with additional layers and parameters to improve the accuracy and robustness of hand gesture detection.*

3.4 Modifying the Code Structure

- *To simplify debugging and make future enhancements easier.*

4 Results

- *The final model was able to detect the gestures with a good accuracy.*
- *The game performed well under various lighting and background conditions, with minimal lag in recognizing gestures and updating the grid.*
- *Despite the challenges, the final product met all the project requirements.*